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Linking Research and Practice

When visiting various works, we are impressed, not so much with the vast quantity of technical information which has been absorbed by the various foundry managers, but with the multitudinous matter they have missed. When we supply these missing data, they are profoundly grateful, but it leaves with us the question as to why the available information had not been assimilated earlier. Holidays, business trips, illness and—more often—preoccupation with day-to-day affairs, are the usual excuses quoted. The remedy for this state of affairs was postulated by Sir Harry Jephcott, D.SC., F.R.I.C. (chairman of the Council of the Department of Scientific and Industrial Research), when he addressed the British Steel Castings Research Association at a luncheon party held in conjunction with the opening of their new laboratories.

Sir Harry said that in order to get full value for money from membership of a research association—or, one might add, from subscriptions to the technical Press—" the best method is the appointment of a member of the technical staff to be responsible for ensuring that research results are understood and applied in the works."

The key words are " making quite sure," for this involves not merely simplification of technicalities, but a profound knowledge of all that is undertaken in the works. The most profitable way for introducing the new matter, is first for the liaison officer within the firm to prepare a clear statement for his chief of what the works are already doing and why, what it is costing, the plant used and any other germane considerations. Then he should show what changes and potential improvements would be brought about by applying data contained in a research report, or Press article. Such a statement would enable a busy executive to reject or take appropriate action. This, of course, applies in major degree only to the larger concerns. The owner of a small foundry should digest as much as possible of the information supplied and then, including a summary of his existing practice, he should write to the association (or Editor of the journal in which the article appears) to ascertain whether the innovation is applicable in his case. By so doing, he might hit upon a real money-spinner, but at least, he will be a wiser man. Another excellent method is for the foundry owner to visit the research laboratories on their " open days ".* On such occasions, it is possible for the visitor to see just what is being done, and what is applicable to his own practice—at least, he can discuss his problems with technical experts and get their reactions to his schemes.

* The British Steel Castings' Research Association has organized a series of " At Home's " over the last week or two, and the British Cast Iron Research Association has similar events scheduled for July 3 and 4.

Royal Message to IBF Conference

At the opening of the Institute of British Foundrymen's Conference in Harrogate on Wednesday last, a message of good wishes was received from Buckingham Palace reading as follows:—

> I am an honorary member of the Institute of British Foundrymen, because I believe that the Institute tries to improve a most important branch of British industry. There are three particular ways in which the Institute can make an important contribution: First, technical education which must seek to provide a proper grounding for the enterprising mind to build upon; education of any sort which produces uniformity of thought is sterile. Second, technical improvements in the art and science of founding; playing safe may avoid mistakes, but it may also be the cause of missed opportunities. Third, discussion of current problems and techniques, both at home and abroad; pride in ability is a good thing so long as other peoples' achievements are taken into account.
>
> I wish the Conference every success.
>
> PHILIP

A reply was sent, thanking His Royal Highness for the message, and he was asked to convey loyal greetings of the Institute to Her Majesty the Queen.

Metal Melting Furnaces

A report prepared under Conditional Aid Advisory Service Arrangements for the Association of Bronze & Brass Founders by the British Non-Ferrous Metals Research Association will be available shortly, its full title being "A Survey of Furnaces for Melting Copper Alloys, with Cost Data Compiled under Production Conditions in Sand Foundries." The data are presented in such a way that not only is it possible to compare melting costs for different equipment but a foundryman can readily see how his own melting costs compare with those representative of other users of similar furnaces. Advantages and disadvantages of various types of furnace are set out, together with data of melting costs collected in a standardized form over a period of three months from a number of foundries. Orders may now be placed with the ABBF (secretaries, Heathcote & Coleman, 69, Harborne Road, Edgbaston, Birmingham, 15) for copies which will be despatched as soon as available —price to members 10s. and to non-members £1 per copy.

Hawker Siddeley Offers Accepted

Holders of more than 94 per cent. of the £5,000,000 issued capital of the Brush Group, Limited, have now accepted the offer for their shares by the Hawker Siddeley Group, Limited. The offer has been declared unconditional and the last date for acceptance is extended to June 21.

The offer by the Hawker Siddeley Group to holders of the £1,000,000 6½ per cent. preference shares of Armstrong Siddeley Development Company, Limited, has been accepted by holders of over 95 per cent. of the shares and is now unconditional.

Sir EDWARD HERBERT has been appointed chairman of the governing body of Loughborough College of Technology from September 1, in succession to Sir Harold West, whose resignation was recently announced.

Safety and Factory Efficiency Exhibition

There is much of interest to the foundry trade in the fourth biannual Safety and Factory Efficiency Exhibition, organized by the Birmingham and District Industrial Safety Group, which opened at Bingley Hall, Birmingham, on June 14 (closing date June 21).

The West Midlands Gas Board is showing latest types of devices and equipment for flame failure and electronic control, while the Midlands Electricity Board exemplifies the use of electrical equipment. Machine guards of all kinds are shown, and there is a vast array of protective clothing together with a display of protective agents. Atomic energy is the main theme of the exhibition and the United Kingdom Atomic Energy Authority has taken the largest amount of space for Atom 57, a display which includes a working model of Calder Hall. A part of the display exhibits sources of radiation, means of dealing with radio-active waste are demonstrated, and there is a demonstration of how an ordinary laboratory can be made suitable for dealing with radioactive substances. A further section is devoted to the uses of radio-isotopes in industry.

Some 300 production engineers from all parts of the country attended the congress, staged in conjunction with the exhibition during the week-end of June 14-16. "Atoms for Efficiency" was the theme of the congress, at which delegates were formally received by the Lord Mayor of Birmingham, Ald. J. J. Grogan. Lectures were given by Mr. Ivor Hopkins, chief training officer of the AEA's industrial group; Dr. H. Seligman, head of the isotope division at Harwell; Dr. A. S. McClean, chief medical officer of the Industrial group; and Dr. J. V. Dunworth, head of the reactor division at Harwell. A group discussion was led by Dr. P. F. R. Venables, principal of the College of Technology, Birmingham.

The first day of the exhibition also coincided with an industrial youth safety conference attended by some 2,000 apprentices, and young people. After an official welcome by the Lord Mayor of Birmingham, a message from the Duke of Edinburgh was read. Sir John Hunt, leader of the Everest team, was among the speakers, who included also Sir George Barnett, Chief Inspector of Factories, and Christopher Brasher, the Olympic Gold Medallist.

Latest Foundry Statistics

The Iron and Steel Board state that the production of iron castings in the first quarter of 1957 was 961,990 tons. Production in the first quarter of last year was 1,039,670 tons. The production by district is shown in the table below:

Production by District.

District.	Iron castings (tons). First quarter, 1956.	First quarter, 1957.
North-East	82,330	71,960
North-West	134,630	133,150
Yorkshire	114,560	112,060
East Midlands	208,480	174,850
West Midlands	209,140	192,650
Eastern Counties	39,630	37,630
Southern Counties	82,870	79,440
Scotland and Northern Ireland	106,150	99,220
Wales	61,880	61,030
TOTAL	1,039,670	961,990

Birthday Honours

Services to the foundry, iron and steel, and allied industries are recognized by awards conferred in the Birthday Honours List, which was published last week. Details of some of the principal awards and biographical notes on the recipients are given below. It is pleasing to learn that several prominent foundrymen have been so honoured—three of these quite recently have been the subject of "feature portraits" in this JOURNAL.*

KNIGHTS BACHELOR

Mr. REGINALD POULTON BIDDLE, formerly docks and marine manager, Southampton Docks, a member of the Management Board of the British Transport Docks Division, and deputy chairman of the Southampton Harbour Board.

Mr. THOMAS ROBINSON FERENS, who is joint managing director of Shipham & Company, Limited, brassfounders and finishers, of Hull, is also joint managing director of George Clark & Sons (Hull), Limited. When the two companies were acquired by Newman, Hender & Company, Limited, iron and non-ferrous founders, of Stroud (Glos), in 1955, he was appointed to the board of the parent company.

Mr. CHARLES JOHN GEDDES is a member of the General Council of the TUC and when, in 1955, he was serving as chairman of the TUC, he was appointed first trades union representative vice-president on the British Productivity Council. Last year he served as a member of the court of inquiry into the dispute over the wages of maintenance craftsmen in the steel industry, under Sir John Stewart.

Air Commodore ARTHUR VERE HARVEY, Conservative MP for Macclesfield since 1945, is deputy chairman of Handley Page, Limited, and a director, among other companies, of Handley Page (Reading), Limited, Mullard Equipment, Limited, and Philips Electrical Industries, Limited.

Mr. FREDERICK PICKWORTH succeeded Lt.-Gen. Sir Ronald Weeks as chairman of the English Steel Corporation, Limited, in 1955, having previously been managing director. He is also chairman of the English Steel Castings Corporation, Limited, Darlington Forge, Limited, the English Drilling Equipment Company, Limited, the English Steel Forge & Engineering Corporation, Limited, the English Steel Rolling Mills Corporation, Limited, the English Steel Spring Corporation, Limited, the English Steel Tool Corporation, Limited, Security Rock Bits, Limited, Taylor Bros. & Company, Limited, and a director of British Acheson Electrodes, Limited, High-Speed Steel Alloys, Limited, the Oughtibridge Silica Firebrick Company, Limited, the Steetley Company, Limited, and Vickers, Limited.

Mr. WILLIAM SCOTT,* whose political and public services in Jarrow have received recognition, is managing director of Armstrong Whitworth (Metal Industries), Limited, and of Jarrow Metal Industries, Limited. He is chairman of Armstrong Whitworth & Company (Pneumatic Tools), Limited, and a director of Jarrow Tube Works, Limited. Two years ago he undertook an important tour in the United States when he discussed centrifuges, iron and steel rolls and tool joints for oil-well drilling equipment with leading industrialists in the US.

Mr. WILLIAM ROBSON BROWN, who has been the Conservative Member for the Esher Division of Surrey since 1950, relinquished his association with Richard Thomas & Baldwins, Limited, in January of last year, in order to devote the whole of his time to his political and other business activities. He had been with RTB for nearly 20 years, recently as conference manager and previously as commercial manager (raw materials).

Mr. EDWARD WALTER THOMPSON is the chairman and managing director of the John Thompson, Limited, group of engineering and foundry companies, Wolverhampton. One of the associated companies of the group is A. E. I.—John Thompson Nuclear Energy Company, Limited, of which Mr. Thompson is a director.

Mr. ALEC THOMAS SHARLAND ZEALLEY, formerly a director of Imperial Chemical Industries, Limited, succeeded Sir Brunel Cohen as chairman of Remploy, Limited, last year. Mr. Zealley joined the forerunners of ICI, Brunner Mond, in 1920 and was engaged in the first commercial synthetic ammonia plant at Runcorn, becoming process director when a similar plant was erected at Billingham. In 1945 he was appointed chairman of ICI's Billingham division and resigned in 1951 shortly after his appointment to the main board.

ORDER OF THE BATH

Civil Division

CB

Mr. KEITH LIEVESLEY STOCK, Under Secretary, Ministry of Power, served first with the Petroleum Department of the Board of Trade. He joined the Ministry of Fuel and Power in 1942 and was promoted to Cabinet office in 1954.

ORDER OF ST. MICHAEL AND ST. GEORGE

KCMG

Mr. AUSTIN RICHARD WILLIAM LOW, MP for Blackpool North since 1945, was Parliamentary Secretary to the Ministry of Supply from 1951 to 1954 and then, until this year, was Minister of State, Board of Trade. He joined the board of Dowsett Holdings, Limited, and was elected deputy chairman in February, and the following month was appointed to the board of the General Electric Company, Limited.

CMG

Mr. ROLAND STUART ANDREWS, chairman and managing director of the Gas and Fuel Corporation, Victoria, Australia.

ORDER OF THE BRITISH EMPIRE

Civil Division

KBE

Capt. Sir IAN FREDERICK CHENEY BOLTON, for services to the Boy Scout movement in Scotland. He is the second baronet and is Lord Lieutenant of Stirlingshire. Sir Ian is a director of Beckett & Anderson, Limited, British Polar Engines, Limited, the Coltness Iron Company, Limited, and Ioco, Limited, and has been a part-time member of the British Transport Commission since 1947.

CBE

Mr. CHARLES KELLAM BIRD, general manager of the Eastern Region of British Railways, is chairman of the Humber Graving Dock & Engineering Company, Limited; Mr. ARTHUR THOMAS BLACK, director of electronic production (munitions), Ministry of Supply. Mr. JAMES WILLIAM CAMPBELL, financial adviser to the Iron and Steel Holding and Realization Agency

* Mr. E. Player's portrait and biography appeared in the JOURNAL, February 5, 1953, those of Dr. J. G. Pearce, O.B.E., on February 4, 1954, and those of Mr. W. Scott on November 1, 1956.

Birthday Honours

since its formation. He was formerly chief accountant and assistant secretary of Stewarts and Lloyds, Limited. Mr. REGINALD LAWRENCE ELKINGTON, controller of the Export Licensing Branch of the Board of Trade; Col. NORMAN RANDALL ELLIOTT, chairman of the South Eastern Electricity Board since 1948. Group Captain EDWARD FENNESSY, managing director of Decca Radar, Limited. Mr. HOWARD WALKER GRIMMITT, chief engineering inspector of the Ministry of Power. Mr. FRED MARSHALL, chairman and managing director of Thos. Marshall & Son, Limited, galvanizers and sheet metal workers, of Leeds; Prof JOHN LAMB MURRAY MORRISON, Professor of Mechanical Engineering of the University of Bristol. He was appointed to the Advisory Council on Scientific Research and Technical Development of the Ministry of Supply in 1953. Mr. JAMES GEORGE PEARCE,* director of the British Cast Iron Research Association for many years and a prominent personality in the ironfoundry industry. He has served on many committees within the industry, and is the author of a number of papers read before various technical bodies. He was made OBE in the New Year Honours of 1950. Mr. EDWARD PLAYER,* deputy chairman and managing director of Birmid Industries, Limited. He is chairman and managing director of Birmabright, Limited, chairman and joint managing director of Birmetals, Limited, chairman of Birmidal Developments, Limited, and the Perry Bar Metal Company, Limited, managing director of Sterling Metals, Limited, joint managing director of the Birmingham Aluminium Casting (1903) Company, Limited, and a director of Birmid Auto Castings Pty., Limited, and the Midland Motor Cylinder Company, Limited. He first represented Birmid Industries on the Aluminium Development Association in 1945 and was elected president in 1950. Mr. SYDNEY SMITH succeeded Sir Andrew Clow as chairman of the Scottish Gas Board last year. He is a member of the Gas Council and a director of Scottish Tar Distillers, Limited. Dr. DOUGLAS GEORGE SOPWITH has been director of mechanical engineering research of the Department of Scientific and Industrial Research since 1951. He is a member of various scientific and technical committees and of British delegations to international conferences on engineering standards. Mr. CHARLES MALCOLM VIGNOLES, managing director of Shell-Mex & B.P., Limited, chairman of Bottogas, Limited, and the National Benzole Company, Limited, and a director of a number of companies associated with the oil industry. Mr. WILLIAM REGINALD WHEWAY, for political and public services in Walsall. Mr. Wheway is chairman and managing director of Job Wheway & Son, Limited, chainmakers, of Walsall. Mr. JOSEPH WRIGHT, a director of the Dunlop Rubber Company, Limited.

OBE

Mr. COLIN STANLEY KNOWLES BENHAM, a director of Benham & Sons, Limited, cooking, heating, and ventilating engineers, of London, W.1, and of the Engineering & Lighting Equipment Company, Limited.

Mr. JOHN HORSFALL DYDE, deputy chairman of the Eastern Gas Board, chairman of the Westgate and Birchington Water Company, and a director of P.R. Chemicals, Limited, and the Prince Regent Tar Company, Limited. He was appointed a member of the Gas Council Research Committee in 1951, the year of his presidency of the Institution of Gas Engineers.

Mr. FRANCIS JOHN HARTWELL, principal scientific officer, Safety in Mines Research Establishment of the Ministry of Power; Mr. FRANK HILL, Regional House Coal Officer of the North Midland Region of the House Coal Distribution (Emergency) Scheme.

Mr. GEORGE MORRISON, managing director of the Greenock Dockyard Company, Limited; Mr. JOHN ALEXANDER PHILIP, managing director of Philip & Son, Limited, engineers and shipbuilders, of Dartmouth (Devon); Mr. MICHAEL JOSEPH RONAYNE, chief engineer of the Ford Motor Company, Limited.

Mr. JOHN THOMAS TOMBLIN, superintendent of the planning trials division of the Atomic Weapons Research Establishment, Aldermaston; Mr. GORDON WESTON, technical director of the British Standards Institution; Mr. EDWARD WHITWORTH, deputy research manager (Nobel division), Imperial Chemical Industries, Limited; Mr. ARTHUR WRAGG, manager of the shell department and chief metallurgist, Vickers-Armstrongs (Engineers), Limited, Newcastle-upon-Tyne.

MBE

Mr. THOMAS HENRY ARNOLD, deputy controller of research, Hadfields, Limited, steelmakers, of Sheffield; Mr. HAROLD DENOVAN BRUCE, head of the electronics application department of W. H. Smith & Company, Electrical Engineers, Limited, Manchester.

Mr. EDWARD JAMES COTTERELL, production superintendent of the Wellington Tube Works, Limited, Great Bridge (Staffs); Mr. HAROLD CECIL FRANCIS GILL, senior accountant, Ministry of Power; Mr. HENRY LLOYD, chief experimental officer, metallurgy division, Atomic Energy Research Establishment, Harwell; Mr. ALEXANDER TURNER MACPHERSON, senior assistant shipyard manager of the Fairfield Shipbuilding & Engineering Company, Limited, Glasgow.

Mr. HUBERT WILFRID NEWILL, personal assistant to the joint managing director of Blaw Knox, Limited, steelworks and furnace equipment contractors, etc., of London, S.W.3; Mr. HERBERT RENTON, manager of the building department of Vickers-Armstrongs (Engineers), Limited, Barrow-in-Furness; Mr. HERMANN RUSBY, design engineer of the Metropolitan-Vickers Electrical Company, Limited, Sheffield; Mr. KENNETH SCOTT, outside manager for Hawthorn, Leslie (Engineers), Newcastle-upon-Tyne; Mr. ALBERT JOHN SMITH, chief of production control at the commercial engineering factory of E.M.I. Electronics, Limited, Hayes (Middx.); Mr. ANDREW MCKIE WARD, secretary of the Scottish Engineering Employers' Association; Mr. ROBERT WHATLING, docks manager, Garston Docks, of the British Transport Commission; Mr. RONALD GEORGE WINTON, director and technical manager of Lansing Bagnall, Limited, transport engineers, of Basingstoke (Hants).

BEM

Mr. T. D. BUCKLE, laboratory worker, Grade A, Atomic Weapons Research Establishment, Aldermaston; Mr. JOHN CONNOR, foreman blacksmith, Clyde Alloy Steel Company, Limited, Motherwell; Mr. T. W. DAVIES, sheet metalworker, Marston Excelsior, Limited, heat exchange engineers, of Wolverhampton; Mr. J. L. HUNTER, foreman steel erector, Harland & Wolff, Limited, shipbuilders, of Belfast; Mr. J. H. LAING, skilled machinist, the English Steel Corporation, Limited, Sheffield; Mr. C. MCCULLOCH, senior inspector of works, North of Scotland Hydro-Electric Board scheme; Mr. A. C. PINCOTT, laboratory superintendent, turbine systems development, the Plessey Company, Limited, engineers, Ilford (Essex); Mr. D. SPENCE, site welding engineer, Whessoe, Limited, manufacturers of oil refinery plant, Darlington (Co. Durham); Mr. F. W. WATSON, superintendent of the automatic machine shop, Simmonds Aerocessories, Limited, Treforest (Glam); Mr. J. W. WOOLTORTON, foreman, F.N.F. Machinery Manufacturing Company, Limited, Burton-on-Trent; Mr. J. H. YARDLEY, foreman, G. A. Harvey & Company (London), Limited, engineers, of London, S.E.18.

Uses of Cast Iron and Other Materials as Denseners in the Production of Machine-tool Castings

*By Brian Kirby**

The Author, who wrote this paper in his twentieth year, is apprenticed with Ashwell & Nesbit, Limited. By means of part daywork and part evening classes, he is working for a Higher National Certificate in Mechanical Engineering. His employers report his enthusiasm to be such that he was prepared, in his spare time, to carry out the extra research work required for the Paper, on the top of his normal studies.

What follows is a well-reasoned account of practical research work carried out within a foundry. It reveals advantages for silicon carbide over cast-iron as densening material for the surface of iron castings. Notes are included on the effect of design on the possible occurrence of porosity and corner cracking and on the influence of chemical composition on metallographic structures produced in castings. The Paper concludes with cost considerations relating to the use of various denseners, and it is estimated that if some 30 castings of the type described are produced from one set of silicon-carbide denseners, then the initial cost of the material would be covered.

Introduction

Designs of castings are often very complex and involve varying thicknesses of metal. These variations in section are not always gradual, and many problems arise in a foundry when a sound casting is required in which sections change rapidly.

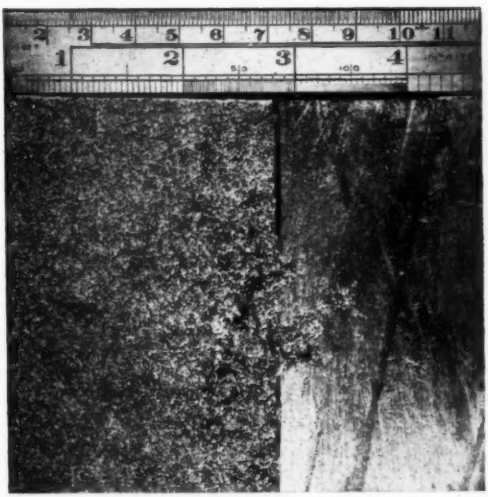
After casting has taken place and the metal in the mould is cooling, the thinner sections solidify while the thicker sections are still in the liquid or pasty form. As further cooling takes place, and the liquid metal continues to shrink in volume, more liquid metal is required to fill the space left by the shrinking metal (See Fig 1).

Fairly rapid changes in section thickness of a casting may also be the cause of cracking, during the time that the casting is cooling, or even upon first machining. The design of castings plays a very important part in their subsequent production. Sharp corners should be eliminated by a radius, whenever possible, and sudden changes of section thickness should also be avoided. Fig. 2 indicates these faults in design which cause porosity and cracking.

Use of Cast-iron Denseners

The most common method used to overcome many of the difficulties mentioned earlier is the use of a piece of metal, generally cast-iron, as a densener, or "chill," in the mould. Denseners are shaped to follow the contour of the casting at the place where they are required and are rammed up in the sand mould in contact with the pattern, the pattern often being marked to indicate the exact location where the densener is required. Denseners are normally made in short segments, each usually not more than 9- to 12-in. long. This is very important, as long one-piece denseners would expand on heating, and if sufficient allowance was not made in the mould for this expansion, when the casting was poured buckling or deformation would occur. In such a case, minimum resistance

FIG. 1—*Typical shrinkage porosity in the centre of a heavy unfed section of an iron casting, revealed both on the cut surface and in the fractured area.*



* The Author of this Paper was awarded joint second prize and a diploma of merit in a competition organized by the Leicester Association of Engineering.

to deformation would be offered by the molten metal and it is most likely that the densener on buckling would force its way into the casting. On removal of the casting from the mould, this would be seen as a deep groove and might result in rejection of the casting at the inspection stage.

A densener is used in the manner described to promote cooling of the metal at a faster rate than the metal would normally cool in sand. For this reason, denseners are used in moulds at places where the metal section-thicknesses are greater than those of the surrounding casting. They are used mainly to even out the rate of cooling of the casting as a whole after the metal has been poured.

Wear-resistant Surfaces

In the case of machine-tool castings, the slideways, or similar surfaces required to resist wear, are often cast as an integral part of the casting. These surfaces are generally much thicker in section than the remainder of the casting, and it has been found that the use of denseners placed in the mould to produce these wear-resistant areas

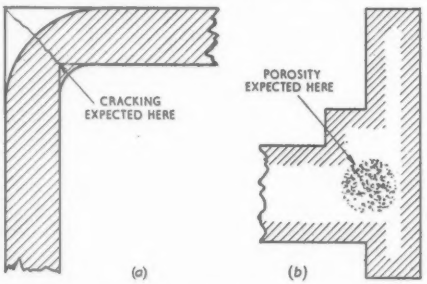


FIG. 2—*Sketches showing the types of defect associated with (a) sharp corners and (b) heavy unfed sections. In each case, the defect is indicated and in (a) shaded section shows an improved design incorporating a generous radius.*

is a great aid to soundness. Alternatively, the composition of the metal could be changed to produce a sound slideway or wear-resistant surface under normal cooling conditions. When, however, these sections are of the order of 1½- to 2-in. thick while the remainder of the casting is probably ¾- to ⅞-in. thick, then, metal of composition suited to produce maximum wear-resistance in the thick sections of the casting, would not solidify as grey cast-iron in the thinner sections. These would more likely be a white or mottled iron, and the metal here would probably be found to be almost non-machinable. Also, there would almost certainly be a great danger of cracking. The composition of the metal must therefore be so constituted to give a grey cast-iron structure throughout even though denseners be used on the thicker sections of the casting.

Effect of Chemical Composition

A paper published in December, 1955, by Angus Marles and Hillman of the British Cast-Iron Research Association, entitled "The Wear of Cast-iron Machine-tool Slides, Shears and Guideways," has shown—in recording an extensive investigation—that a phosphorus content greater than 0.7 per cent. and a microstructure consisting of random, flake-graphite in a pearlitic matrix gave the best results in service. They also concluded that under "boundary-lubrication" conditions, undercooled graphite in a ferritic matrix could result in rapid failure although such a structure might be useful under certain circumstances.

Phosphorus appears usually in grey cast-iron as phosphide eutectic and is a hard, brittle constituent. The prosphorus content of grey cast-iron is normally kept fairly low in general-engineering castings, as high phosphorus is usually believed to be a great factor influencing the formation of porosity and shrinkage cavities. As porosity and shrinkage must be eliminated, and at the same time a high-phosphorus content favours maximum wear resistance, it would appear that further justification

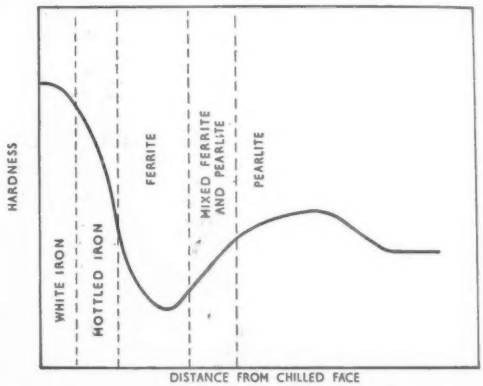


FIG. 3—*Diagram indicating the change in hardness according to distance from a chilled edge of a grey-iron casting. Unless suitable precautions are taken, the ferritic section may coincide with the surface left after the machining allowance has been removed.*

is provided for the use of denseners as the only solution left to the foundryman.

Merits of Cast-iron for Denseners

There are certain advantages in the use of cast-iron as the material to be used as denseners in the production of grey-iron castings. In this material, denseners are fairly easy to produce and the initial cost is reasonable. If large numbers be required of any particular shape relatively easy to mould, such denseners may be produced by machine moulding. As previously stated, they are normally built up to a required length by using

short sections to avoid deformation on reheating, and in this form, also, are easy to handle and assemble in the mould. The disadvantages of cast-iron, however, are numerous; first, because they may only be used once or in certain circumstances, twice, before rejection. It is dangerous practice to attempt to use iron denseners repeatedly, because there is risk of "blowing" trouble caused by oxidation of the densener, also, there is always a danger of the densener "burning-on" to the casting. If this occurs, in addition to the extra work involved in removal, the adhering metal generally disfigures what otherwise might be a good commercial casting.

Cast-iron denseners usually produce a white-iron structure at the face of the casting in contact with the densener, and these surfaces often cause trouble when the casting is machined. The depth of this white-iron structure may not be very pronounced, depending largely on the ratio of the thickness of the densener to the thickness of the casting at that point, and the chemical composition of the casting.

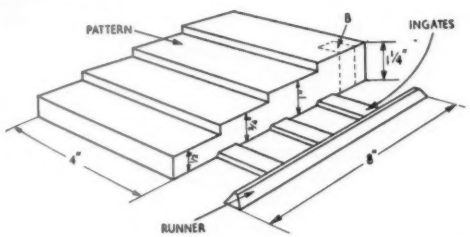


FIG. 4—*Stepped test-pattern (with its runner system) for comparative experiments on materials for use as denseners.*

A further point to be drawn from the BCIRA paper previously mentioned is the effect of undercooled-graphite structure in a ferritic matrix. It has been shown that Brinell-hardness readings taken at varying depths from a densened face have provided some disturbing features. Fig. 3 illustrates this point. The undercooled graphite in a ferritic matrix structure would be in the area shown as ferrite in the illustration and is in fact the softest part of the metal. A more disturbing feature is that if precautions are not taken, the distance from the densened face to the portion marked "A" may coincide with the machining allowance on the particular casting. This would result in the softest material of the casting being exposed as a wearing surface, whereas the structure most suitable for wear-resistance is finely dispersed flake-graphite in a matrix wholly of pearlite.

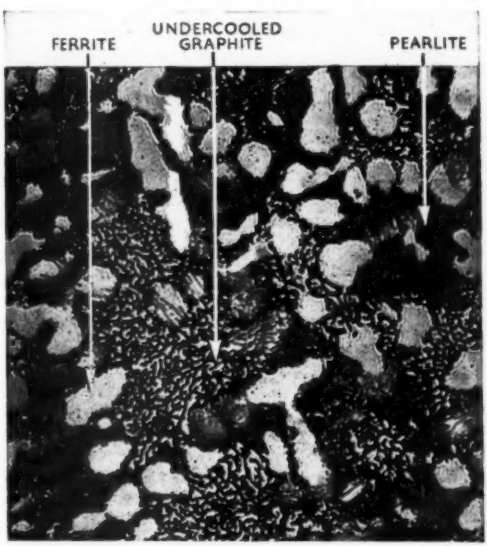
Author's Experiments

On the basis of the foregoing, it was decided to carry out an investigation on the use of alternative materials for use as denseners, and compare the results with those obtained from cast-iron. The investigation was carried out in the foundry at which the Author is employed, the objective being to obtain further information under practical working conditions. As the number of alternative materials to cast-iron as a densener are few, it was decided to confine the experiments initially to comparing cast-iron with silicon carbide as densening material.

A small wooden pattern was made, having varying section-thicknesses, and mounted on a board with its own running system (See Fig. 4). Two moulds were prepared in similar moulding boxes from this pattern. In the first, a cast-iron densener was incorporated and in the second a densener of silicon-carbide. The cast-iron densener was 9 by 4½ by 1 in. deep while the silicon-carbide densener was 9 by 4½ by 2½ in. deep. The castings were made in separate moulding boxes to avoid possible effects due to interference with their natural cooling rates which might be caused by having the masses of metal adjacent to each other. The moulding sand for each mould was prepared in one batch and when the moulds were completed and stove dried they were closed and prepared for casting. A ladle containing a substantial amount of metal was used to prevent any significant temperature loss between one casting and the next during pouring and also to give a consistent metal mix to each casting. The percentage composition of the metal was:—Total carbon, 3.2; silicon, 2.15; manganese, 0.7; sulphur, 0.095; phosphorus, 0.4 per cent.

The castings were allowed to cool overnight in the mould. They were then fettled and shotblasted

FIG. 5—*Photomicrograph (×400) of the etched structure of cast-iron immediately below the "white" area produced by an iron densener.*



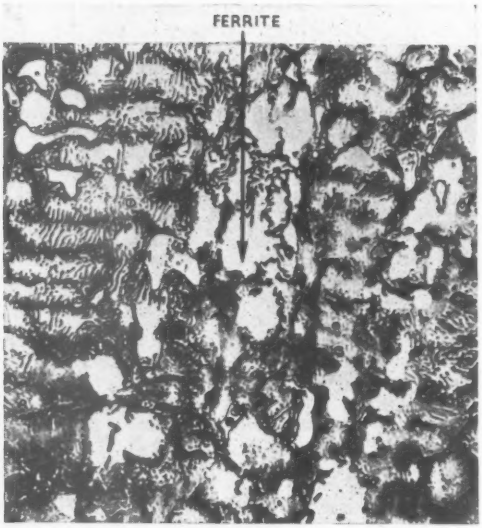


FIG. 6—*Structure of the metal below that shown in Fig. 5 and consisting of a considerable amount of free ferrite* (×400, *etched*).

before being sectioned longitudinally. Each half of each casting was then marked—"C," where the cast-iron densener had been used and "S," where the silicon-carbide densener was placed. All samples taken from either casting were similarly marked to assist in subsequent identification.

A small sample was cut from one half of each casting at the position marked "B" in Fig. 4. These samples were carefully filed and polished for microscopic examination, while still in the unetched condition. The first examination at low magnification, approximately ×40 of the sample densed against cast iron, showed a white structure at the densened edge. The depth of this structure (of cementite (Fe_3C)) was carefully measured and was found to extend to a depth of 3 mm. into the casting. The sample was then etched in 4 per cent. Picral and examined at a higher magnification (×400), when it was found that below the cementite structure at the edge were large areas of undercooled graphite in a pearlitic matrix (see Fig. 5). As examination of the sample traversed the section below the undercooled graphite, free graphite in a finely divided form appeared in a pearlitic matrix, accompanied by a considerable amount of ferrite (see Fig. 6). Some phosphide-eutectic was also present, dispersed throughout the matrix.

The sample densened with silicon carbide, when etched, revealed on microscopic examination the interdendritic type of graphite in a almost completely pearlitic matrix, at ×400 magnifications (see Fig. 7). When this sample was examined at a position further away from the densened face, the structure consisted of interdendritic graphite in a fully pearlitic matrix, with a few small traces of ferrite and some phosphide-eutectic (see Fig. 8).

Next, one-half of each casting was sawn partially through, starting from the side remote from the densened face, at each step or section thickness and then fractured. A definite chill could be seen at each stage in the portion densened against cast iron, while the portions densened against silicon carbide remained completely grey throughout. From experience gained in the machine shop, it has been proved that the latter structure machines easily to give a very close-grain iron of pleasing appearance.

Discussion of Results

The results of this investigation have shown that a superior structure, metallographically speaking, can be obtained by the use of silicon carbide as a densener instead of cast-iron.

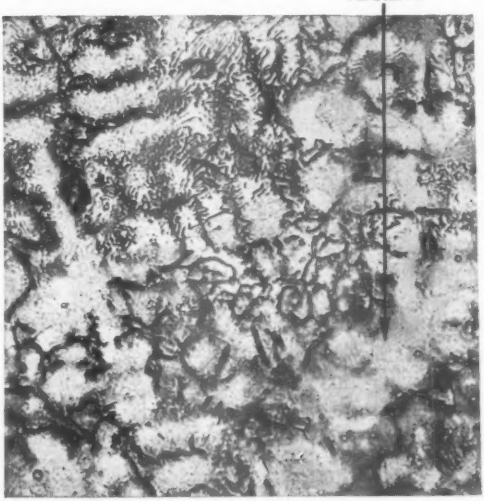
Material so densened has shown that the Brinell hardness numbers increase slightly away from the densened face and remain comparatively steady for a considerable depth. When cast-iron denseners are used, however, the Brinell hardness decreases sharply when traversing from the densened face before recovering to moderate values in the body of the casting (see Fig 9).

Applying this information on a practical basis for machine-tool slides, it is found that great benefits are derived from the use of silicon carbide as a densener.

Example

A casting such as a planer-bed is almost certain to exhibit a degree of camber or bend over its total

FIG. 7—*Specimen from casting densened with silicon carbide, showing an almost completely pearlitic matrix, with the interdendritic type of graphite* (×400, *etched*).



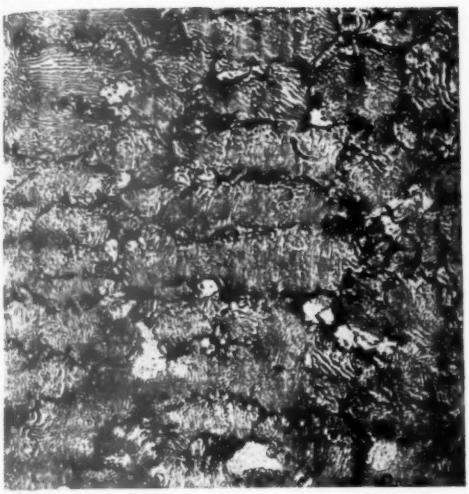


FIG. 8—*Photomicrograph of the structure in the body of a casting densened by the use of silicon carbide is similar to that shown in Fig. 7 but with traces of free ferrite and some phosphide eutectic* (×400, *etched*).

length, when taken from the mould. This means that when such a casting is set up for machining, varying thicknesses of metal have to be removed in different areas to produce a flat slideway, of the accuracy demanded.

When cast-iron denseners are used, the varying amount of metal removed may produce varying structures accompanied by changes in the degree of hardness, as have previously been enlarged upon. This change in hardness will result in a varying amount of wear taking place along the whole length of the slideway, although the actual amount of wear may only be in the region of tens of thousandths of an inch. It will be clearly seen from examination of a sketch, Fig. 10, representing a slideway of the type described, that when wear of the bed slides has taken place, the sliding table in position (1) will only be supported by its ends. In position (2), however, it will be supported only at its middle, but as a result of the varying amount of wear along the slide it will be in a more elevated position than at (1). This will have two obvious effects; *viz*:—(*a*) When the table is under a cutting load, the component being machined will tend to chatter —there being insufficient support under certain sections of the table, and (*b*) the high accuracy of the slideways will be destroyed.

It must be remembered, also, that even though the slideway of the bed be re-machined to restore its flatness, the same variations of hardness and wearing properties will occur, as there will still be inconsistencies in the structure along the length of the slideway. Therefore, subsequent wear will follow much the same pattern as before.

Silicon-carbide Slideway Denseners

In contradistinction to the case just cited, examination of the graph of hardness (Fig. 9) from the densened face inwards, makes it clear that the hardness below the surface of the sample cast in contact with a silicon-carbide densener increases slightly and then maintains a uniform hardness up to a distance of 1¼ in. from the cast face. Brinell hardness readings in this case show that from ¼ to 1¼ in. below the surface the variation is indeed almost negligible. Taking account of the structure accompanying these hardness figures, as illustrated by the micrograph (Figs. 7 and 8), it is clear that the chances of providing a slide of uniform hardness and wearing properties are greatly increased if silicon-carbide denseners are used.

Other Considerations

Silicon carbide has only been used in the form of densener for iron castings in recent years. This material has however proved of great value, mainly because of the ease of machining of the densened face of the casting. The investigation recorded by the Author and the metallurgical results obtained have proved that in addition to the machining qualities the structure of the cast-iron densened by silicon carbide is superior to that densened by cast iron. There is little if any

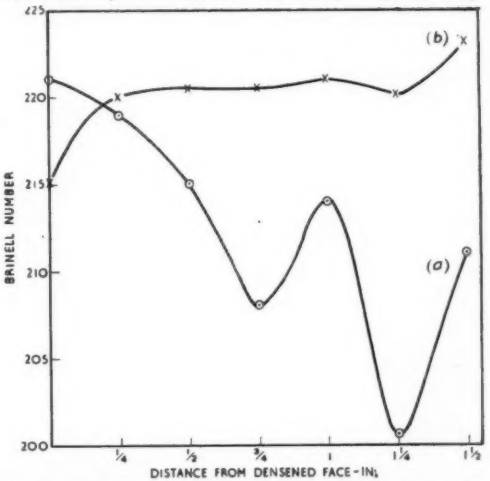


FIG. 9—*Hardness according to distance from the surface of iron castings made with* (*a*) *cast-iron and* (*b*) *silicon-carbide denseners.*

risk of "blowing" troubles resulting from silicon carbide in contact with molten metal and no risk of "burning-on." The working "life" of this type of densener has not yet been determined, but over 100 castings have been produced using a set of these denseners and no sign of deterioration is apparent. When comparative costs were worked out, it was clear that if 30 castings could be produced from one set of silicon-carbide denseners, their initial cost would be covered.

Conclusion

From the investigations carried out it would appear that for certain applications the silicon-carbide densener is far superior to that of cast iron, and although the initial cost is high, careful handling can result in many more castings being produced from a given set of denseners of the new material.

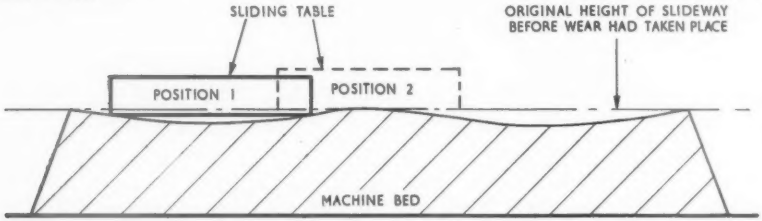


FIG. 10. — *Sketch of planing-machine slideways showing the effect of uneven wear.*

The castings so produced to date have proved to have an excellent finish after machining, and have caused no trouble in the machine shops, with regard to hardness. In this context, it should be remembered that one really hard spot caused by a white-iron structure can cause serious trouble to cutting tools which are costly items to repair or replace.

Acknowledgments

The Author wishes to thank Ashwell & Nesbit, Limited (for allowing him time to carry out this research work in their iron foundry), the British Cast Iron Research Association and the Carborundum Company, Limited (for permission to use technical information from papers published by them, especially Brinell-hardness readings and photomicrographs as facilities for obtaining these were not available to him).

Minimizing Dependence upon Nickel

For more than two decades the possibility of replacing some of the nickel in conventional stainless steels with manganese has been closely studied. It may be recalled that the function of nickel in stainless steel is to form austenite and retard its transformation to martensite during cold-working. Nickel also has a significant cumulative effect on corrosion resistance in the presence of chromium. During the Korean conflict the use of nickel in the United States for most civilian products was limited to a maximum of 1 per cent., and this resulted in experiments with a stainless alloy composed of Cr 15 per cent.; Ni 1 per cent. and Mn 17 per cent. But while mechanical properties of this material were satisfactory, its corrosion resistance and hot-working characteristic were inferior.

Discussing problems in manufacture, it is stated that most of these have been solved. Because of their higher strength, greater power is needed in initial break-down of the ingot. For maximum alloy recovery, and to prevent any difficulty in controlling manganese content of high-nickel austenitic steels, segregation of scrap is recommended. It is possible to recover as much as 85 per cent. Mn and 90 per cent. Cr from the scrap by back-charging, near the end of the reducing period. In working a charge, carbon-steel scrap and low-manganese stainless scrap, totalling, say, 60 per cent. of the charge, are melted and the heat blown with oxygen to reduce carbon below 0.10 per cent. During this oxidizing period nearly all the chromium oxidizes and enters the slag. Additions of chromium-silicon or manganese-silicon ferro-alloys then reduce much of this chromium oxide; the remaining scrap is added and the heat brought back to temperature. Necessary additions of chromium and manganese alloys are made to produce the desired composition and the heat finally deoxidized with a lime-alumina slag. When high-manganese scrap is melted down initially, the oxidization of chromium and manganese will reduce recovery to as low as 30 per cent. of the manganese and 75 per cent. of the chromium. In general, the corrosion resistance of these steels is approximately the same as Types 301 and 302: Cr 17-Ni 7 and Cr 18-Ni 9 steels, and there is every indication that Types 201* and 202* can replace them in any application where they are being properly used.

A number of corrosive-chemical laboratory short-time tests have indicated no appreciable difference between the high-nickel and the low-nickel steels, while scaling resistance of the new steels is equivalent to that of Types 301 and 302 up to approximately 1,550 deg. F. (approx. 850 deg. C.). The rate of work-hardening is about the same as that of the comparable chromium-nickel types. Limited test data have indicated that the modulus of elasticity of the steels is 28,600,000 lb. per sq. in.—slightly higher than the 28,000,000 lb. per sq. in. modulus of the Cr-Ni steels.

* Types 201 and 202 alloy steels were introduced during the Korean conflict and are of the following composition and properties:—Type 201: Cr 16-18; Ni 3.5-5.5; Mn 5.5-7.5; C 0.15 max.; yield strength approx. 25 tons per sq. in., tensile, 51 tons per sq. in., elongation on 2 in. 55 per cent.; Rockwell hardness B 90.

Type 202: Cr 17-19; Ni 4-6; Mn 75-10.0; C 0.15 max.; yield strength approx. 25 tons per sq. in., tensile 49 tons per sq. in., elongation on 2 in. 55 per cent.; Rockwell hardness B 90.

Europe's Steel Output

European steel production in 1956 reached record proportions, and the rise continued in the first quarter of this year. Details are given in the quarterly *Bulletin* issued by the Economic Commission for Europe. Compared with the first quarter of 1956, the percentage increase in the main steel-producing countries for which production figures are already available was as follows:—Western Germany, 5; United Kingdom, 2; France, 7; Belgium, 5; Italy, 20; Poland, 10; Luxembourg, 5; Saar, 6. On the whole, the increases are somewhat lower than the increases for the same period in last year over 1955, except in Italy, where the figures for 1957 show a considerable increase. In the United States, production in the first quarter of this year was down by 4 per cent. on January-March, 1956. Japan's production continued to increase in January and February over the high level attained in 1956.

The current issue of the quarterly *Bulletin* contains official figures relating to the Polish steel industry, published for the first time since 1947, giving the production of pig-iron and steel by quality and process, the production of rolled products, and consumption of raw materials, for the years 1955 and 1956. Total imports of finished steel by the main importing countries decreased by 4 per cent. in 1956 compared with 1955, while the bulletin's figures show that total exports increased by 8 per cent. in the same period, resulting in a slight rise in the volume of total foreign trade.

Simon-Carves' Contracts

Increased value of contracts obtained in 1956 was easily a record, states Mr. R. B. Potter, chairman of Simon-Carves, Limited, coke oven, gasworks, and chemical plant engineers, of Stockport (Ches), in his annual review. Orders in hand at the end of the year were some 30 per cent. greater than at December 31, 1955, and the company's prosperity should be assured for some years.

Mr. Potter warns that any large immediate rise in profits should not be expected, but goes on to say that in view of the enlarged programme for nuclear power stations the company could expect substantial work in this country, and hoped to compete seriously for exports, for which it already had active inquiries.

As fairly heavy expenditure was incurred on new work—in particular the substantial development and administrative costs of nuclear power were almost entirely charged against profits—the group profit of £1,374,024 (£1,385,041) could be considered very satisfactory. The year's dividend is 20 per cent., against 28¾ per cent. on smaller capital.

Canadian Iron and Steel Output Up

Steel-ingot production in Canada declined slightly in May, but for the first five months of this year output was still ahead of that of the same period a year ago. Pig-iron production, however, continued higher both for the month and the five-month periods.

Output of steel ingots amounted to 417,321 tons in May, 7.6 per cent. lower than last year's comparable figure of 451,281 tons. In the first five months output showed a gain of 3.3 per cent. to 2,190,089 tons, compared with 2,121,069 tons.

May pig-iron production came to 336,392 tons, or 15.4 per cent. over the previous May figure of 291,300 tons. In the period ended May, production aggregated 1,592,700 tons, or 11.8 per cent. above the corresponding 1,424,566 tons last year.

Critics Please Note

Recent criticisms of the appointment of men to posts of responsibility for which they have had no previous experience were met, in part, by Sir Richard Powell, director general of the Institute of Directors, when he addressed the Aberdeen centre of the Scottish branch of the Institute. The critics asked why industry accepted so many ex-soldiers, ex-sailors, and parliamentarians on its boards of directors—men who had no knowledge of the intricacies of the business.

There was the answer, said Sir Richard. It was exactly because these men's view of the industrial "wood" was not obstructed by the "trees" of technology that they earned their place on the board. Some companies had failed, or come to the very edge of failure, simply because their boards were overloaded with experts—experts in everything except the top-priority boardroom task of policy building. He believed that the man who juggled with complicated mathematical formulæ was not a good judge when it came to deciding whether to open new markets overseas or to make a new issue of capital.

It was here, said Sir Richard, that the man of vision, with knowledge of conditions in foreign countries and world-wide experience in other fields, came into his own. There was plenty of room on the board for men who had never seen a lathe turn, a loom weave, or a ship riveted—for many of them could broaden industry's vision and bring a refreshing new approach to its problems.

Contract for Scots Firm

In competition with British and foreign manufacturers, Bruce Peebles & Company, Limited, Edinburgh, has obtained a £250,000 order for three 90,000 kva transformers for the Magill sub-station of the Electricity Trust of South Australia. The transformers are for connection to the Adelaide end of the 275,000-v transmission lines from Port Augusta power station.

The transformers, which will weigh about 200 tons each, will be the largest three-phase units installed in Australia. They will be designed to withstand lightning surges of over 1,000,000 v. Mr. Duncan McDonald, Bruce Peebles' chief transformer designer, who has just returned from a round-the-world journey, had a number of discussions with electricity authority officials and transformer design experts in Australia, New Zealand, Canada, and the US. They showed an extreme interest in the development work being carried out in Scotland.

Margam Steelworks' Problem

Prolonged drought could give rise to a serious situation at the Abbey Works of the Steel Company of Wales, Limited. An official of the company has stated that there is no emergency at the moment, but if there was a long drought the works might experience difficulties.

Glamorgan Planning Committee is having to weigh the claims of the wild bird life at the historic Kenfig Pool, near Porthcawl, against the demands of the steelworks. Members of the committee were told, recently, that the steelworks might come to a full stop within a few weeks unless it could take water from the pool by pipeline to the Kenfig River. The company had asked for permission to reduce the level of the pool from 8 ft. to 2 ft. A pipeline is ready for use and negotiations are going on with the Margam Estate, where the pool is situated, to provide for long-term requirements of the company.

Law Cases

Power Supply Charges

Second judgment in the protracted litigation between the British Oxygen Company, Limited, Glasgow, and the South of Scotland Electricity Board and the Central Electricity Authority, was given by Lord Hill Watson in the Glasgow Court of Session.

The British Oxygen Company is suing for £10,000 as repayment of alleged overcharge for supply and asks the court to set aside certain "industrial maximum demand tariffs" under which charges were said to have been made. It is alleged the tariffs are not legal and should be set aside.

After debate early in 1955 Lord Hill Watson dismissed the action as irrelevant and the plaintiffs appealed to the Second Division, who allowed a proof before answer. This decision was later affirmed on appeal to the House of Lords. During the hearing in the House of Lords the defendants submitted new arguments.

Justification for Preference

It was contended that if all consumers were charged the same price there would be no discrimination and no preference, but it was clear that the company and other high voltage consumers were charged less per unit per month under the tariffs. The preference was justified by the greater cost per unit of supplying low voltage customers. In his speech in the House of Lords, Lord Normand said this new submission by the defenders was crucial to the decision of the action, and it was of the greatest importance to all users of electricity and also of gas.

Lord Hill Watson recently heard fresh arguments and, giving judgment, said the cost of supply by the undertakers was irrelevant and the question had to be decided on the terms of the tariff. The defendants had chosen to gear the price per unit to the cost of fuel by what was known as the "fuel variation" clause.

If this disclosed a preference or discrimination then the plaintiffs could not be refused an inquiry.

The plaintiffs were, therefore, entitled to a proof before answer upon their plea that the board exercised undue discrimination against industrial users in fixing the tariff. They were also entitled to a proof before answer on the question of discrimination.

He would dismiss the plaintiffs' plea in support of their contention that the tariff was illegal and should be set aside. No reason had been given why the plaintiffs did not take the appropriate remedy of interdict. He was also of the opinion that no relevant pleas had been made by the plaintiffs in support of their claim for £10,000.

Crown Wins Tax Appeal

Lord Evershed, Master of the Rolls, allowing a Crown appeal in a tax case, said that it was "a common-sense conclusion." The appeal concerned a provision in the 1937 Finance Act which limits, for profits tax computation purposes, the amount allowed for remuneration of directors of companies in which they hold a controlling interest.

The court held that S. Berendsen, Limited, agricultural machinery and metal merchants, Pall Mall, London, the respondents, was a company coming within the provisions of the Act. Lord Evershed said that the three directors held 401 of the company's shares and a further 590 were held by a Danish company controlled by one of the directors. The special tax commissioners put the two lots of shares together and found that Berendsen's were "director controlled," but Mr. Justice Wynn-Parry had reversed that decision on the ground that he ought not to go outside the register of shareholders.

Lord Evershed thought that previously decided cases did not prevent the common-sense conclusion that the directors had a controlling interest. Lords Justices Morris and Pearce agreed. The Crown's appeal was allowed, with costs, and the tax commissioner's ruling restored.

£12,500 Damages for Headlong Fall

"Disastrous" injuries sustained in a 30-ft. headlong fall nearly three years ago led to an award of damages totalling £12,500 with costs against Babcock & Wilcox, Limited, at Durham Assizes. The plaintiff was Mr. James Kelsey, a 43-year-old steel erector, who was said to have been reduced to "a wretched state" for the rest of his life. He alleged negligence and breach of statutory duty against the defendant company. The firm denied this and blamed Mr. Kelsey for the accident.

Mr. P. Stanley Price, QC, representing the plaintiff, said the accident happened while Mr. Kelsey was working on a new power station at Barking, in August, 1954. Mr. Kelsey fractured his skull after overbalancing and falling 30 ft. headlong on to a concrete floor. He also had organic brain damage.

The judge said the allegations of contributory negligence by Kelsey had not in his view, been established. "No sum which I can award can restore what he has already lost and will lose both financially and in his enjoyment of life." He granted a 28-day stay of execution, limited to £11,000, on an application by Mr. H. Scott, for the company.

Spanner Slipped and Caused Fall

Plea that a plaintiff failed to take sufficient care succeeded at Chester Assizes when an action for damages against John Summers & Sons, Limited, Shotton (Ches), was dismissed by Mr. Justice Jones.

The plaintiff was Mr. Samuel Taylor (56), a fitter's mate, who was injured when he fell from a 10 ft. 6 in.-high platform at the Shotton Steelworks. Mr. Norman Richards stated that Mr. Taylor's spanner slipped off a nut and struck him in the face causing him to fall. There was no guard rail. Mr. Taylor received skull and spine injuries. For the defendants it was claimed that Mr. Taylor failed to take sufficient care.

Mr. Justice Jones said he considered the defendants were not guilty of any negligence as the platform was a perfectly safe place to work. It was not very high and had the plaintiff exercised more care he would not have been involved in the accident.

A MEETING FOR MEMBERS of the London and Home Counties area of the Association of Bronze & Brass Founders will be held at the Clarendon Restaurant, Hammersmith, on Wednesday, June 26, commencing 12 noon. After luncheon (at 1 p.m.) the meeting will be continued at 2.15 p.m., when Mr. E. C. Mantle will introduce a report, prepared by the advisory service of the Association, entitled "A Survey of Furnaces for Melting Copper-alloys with Cost Data compiled under Production Conditions in Sand Foundries" (see page 746 of this issue).

The House of Lankester

Features of the modernization of small, old-established foundries at Southampton to bring them to present-day standards of good-housekeeping and especially to conform to the recent Foundry Regulations.

Cast-iron corestove doors of Lankester's foundry which, dated Southton (Southampton) 1832, bear eloquent witness both to the antiquity of the firm and the durability of cast-iron for this purpose.

The house of Lankester & Son, Limited, Holyrood Place, High Street, Southampton, was founded in 1685, during the second part of the reign of Charles II. The original business was probably that of a ships' chandler, which still to-day forms part of the firm's activities. Other trades include mechanical engineering, sheet-metal work, the retinning of the utensils from ships' galleys, heating and ventilating, iron and non-ferrous founding. It is definitely established that ironfounding was being carried on in the year 1832, because the doors of the corestove, which are illustrated at the head of this article, clearly carry this date. Richly ornamented, these cast-iron doors have withstood repeated heatings by coke fires (and latterly, by town's gas) for well over a hundred years.

Foundry evolution takes place by stages, so that no doubt during the three hundred years of the existence of Lankester's, some of the departments have alternated between being thoroughly up-to-date and completely old-fashioned. It would seem that the iron foundry had lagged behind the times, until recently, when Mr. R. Stewart, the managing director,* decided upon a complete reorganization, so that it should conform to modern concepts for foundries and, in particular, the recent Foundry Regulations. The result is that the natural lighting of the shops is now excellent, good use being made of corrugated Perspex " glass " in the roof, whilst strip lamps are used on dull days and for night work. A showerbath and washroom with a good supply of hot water has been installed. The knocking-out of the castings has been centralized at one position. The cupolas have been furnished with efficient spark-arresters; the space in front of the cupolas is well removed from the moulding section and, above all, good-housekeeping is everywhere in evidence.

* With regret it has to be reported that Mr. Stewart has died since the preparation of this account.

Melting Plant

Two cupolas are available and are employed on alternate days, one is a Jackman plant of 2 to 2½ tons per hour capacity, and the other is by Constructional Engineering Company, Limited, for

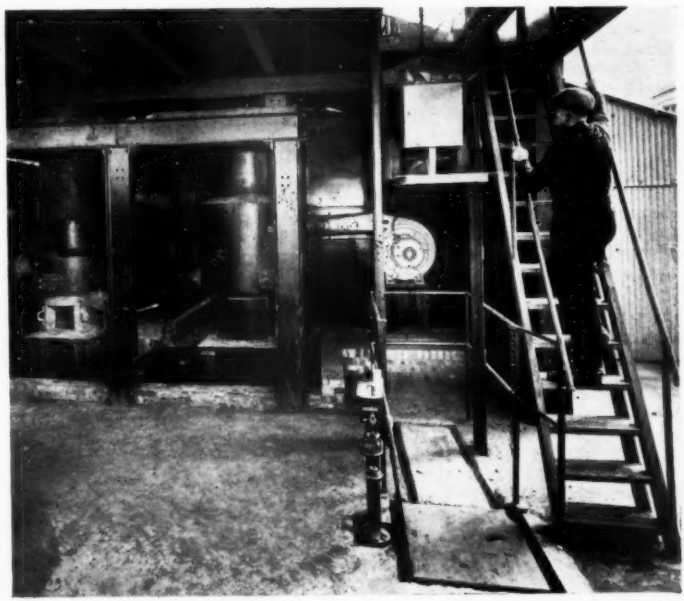


FIG. 1.—*Rear view of the cupolas, showing the platform scale and hoisting mechanism for loaded skips, one of which can be seen nearing the charging stage.*

FIG. 2.—*Macnab jolt/squeeze moulding machine, surmounted by a large-capacity storage hopper fed by means of a bucket elevator.*

melting 30 to 35 cwt. per hour. The stockyard is quite small but very neat, as only a moderate quantity of pig-iron need be kept in hand. Likewise, in respect of scrap iron, the supplier keeps an adequate stock on hand and can be relied upon to deliver daily a suitable quantity for immediate use. The cupola-charge materials are loaded into wheeled skips, weighed, and taken to the stage by a ½-ton, electrically-operated Planet pulley-block (Fig. 1) and afterwards charged direct into the cupola. The stage is roomy and can hold a day's supply of pig-iron, scrap and coke. The furnaces each have their own fan and their ignition is effected by a gas "poker." The spouts of the cupolas project through a wall into the foundry where, if the metal is not to be hand shanked, it fills a large ladle mounted on a wheeled bogie running on a quite short length of rail. This is necessary as the crane does not quite span the far end of the shop.

Shop Layout

The 30-cwt. overhead crane is electrified so far as hoisting and lowering are concerned, but manually operated as to traverse. At the end of the shop, opposite the cupolas, is a Macnab jolt/squeeze/strip moulding machine (Fig. 2). It is surmounted by a sand hopper—so far free from hammer marks—which is filled by a belt-and-bucket elevator.

The sand-preparation system is quite simple. Knocking-out is effected on a Sterling plant installed at the side of a roller-conveyor loop which covers the central area of the main floor of the shop. The knocked-out sand falls into a shallow pit where a short inclined ramp allows of its easy removal by shovel. Thereafter, mixing is a batch operation, new sand, coal-dust, etc., being added as required in the 4-ft. dia. sand mill. From the mill, the sand passes through a vibrating riddle and then feeds the boot of a sand elevator. The moisture content of the sand is controlled with the aid of a "Speedy" moisture tester.

Manned by two men, this simple mechanized moulding system, incorporating a single-loop roller conveyor (Fig. 3) is turning out about 50 boxes per day, each box containing six castings; Sterling and Tallis steel boxes are used. Shortly after the luncheon break each day, the moulders have just about filled the conveyor by the time casting begins. In a bay at the right of the shop—viewed from the cupola end—there is space devoted to moulding-box storage. On the left is a floor devoted to jobbing work and leading off from this is a small fettling shop. Also leading off is a small coreshop, with the core-drying stove which has already been referred to. At the far end, there is an opening to the non-ferrous section.

FIG. 3.—*General view of the iron foundry at the works of Lankester & Son, Limited, showing the central roller-conveyor system, knock-out (left, foreground) and the moulding-box storage bay (left, background).*

FIG. 4.—*Lees Hall, 600-lb. capacity, tilting furnace in Lankester's non-ferrous shop. Situated close to the back wall are two gas-fired Lees Hall pit furnaces, one of* 100 *to* 150 *and the other* 200 *to* 250 *lb. capacity.*

Non-ferrous Foundry

The non-ferrous section is a neat and clean shop equipped with two gas-fired Lees Hall pit furnaces, one of 100 to 150-lb. and the other of 200 to 250-lb. capacity and nearby, on the side wall, there is a 600-lb. gas-fired tilting furnace (Fig. 4), by the same makers. Further down the shop there is a Coleman-Wallwork git-cutting machine furnished with its own exhaust system. Quality control in the non-ferrous section is effected by employing only ingots of guaranteed composition, the makers of these taking back the "awkward" scrap. The firm has achieved a high reputation for the making of straight, aluminium-bronze, nickel/aluminium-bronze, aluminium-alloy, and bronze castings.

When a firm embarks on a renovation project of the character described, its action can never be static and, already, it has been found that the fettling facilities must be improved to cope with the increased output, and modern plant is to be installed. However, what has already been accomplished with quite a modest outlay at the "house of Lankester" may serve to encourage other founders who are in a small way of business to embark upon similar schemes. These and other readers will be grateful to Lankester's for permitting this report of their modernization schemes to be published.

Notes from the Branches

Northampton

The annual general meeting of the Northampton and district section of the East Midlands branch of the Institute of British Foundrymen, took place at the Plough Hotel, Northampton, on Thursday, April 25, at 7.30 p.m. Officers elected for the next session 1957/58 were as follow:—President, Mr. T. Reynolds; senior vice-president, Mr. J. T. Stevens; junior vice-president, Mr. H. Edge, and hon. secretary, Mr. W. D. Ford. The Council were re-elected *en bloc*, and Mr. Hanson proposed a vote of thanks to Mr. L. W. Bolton, the retiring president, for the able and considerate manner with which the president's duties had been performed; the proposal was carried with acclamation.

Mr. Bolton, who retained the chair for the remainder of the meeting, then introduced Mr. C. M. G. Wallwork, managing director of Henry Wallwork & Sons, who presented a paper entitled "An Approach to Mechanical Handling in the Foundry." The paper, which dealt with the application in the foundry of cost control and work-study, was well received and contained much information that was new to the audience.

The Northampton section is making steady progress with a good regular attendance at meetings and a small but steady influx of new members.

Increased West German Steel Output

Output of steel in west Germany during the month of May, at 2,067,000 tons, was the second highest on record. During the January-May period, production totalled 10,024,000 tons, against 9,359,000 tons in the comparable period last year, an increase of 7 per cent.

Automatic Blast-furnace Control

A recent development in so-called automation is the system of electronics developed by Cutler-Hammer for blast-furnace control at the Fairless works of the United States Steel Corporation. Described briefly in *Iron Age*, recently, it is pointed out that a control console in the hoist house sets the charging pattern with the operation of a few switches. A push-button on another control console at the scale house initiates the actual charging cycle. Console operators know exactly where the charging skips are located, what they are carrying, how far the loading cycle is advanced, position of the stock rods, amount of charge carried on the large and small bells, and it is added, much more. The system was developed to meet the need by steel mills for putting all necessary charging data into a central control point and from that stage eliminating human error.

The layout is designed to give both operators all data at a glance. A charge of two skips of ore, one of limestone, and one of coke (repeated for two complete cycles) would show up on the board as two pink lights (ore), one yellow (limestone) and one blue (coke). A travelling green light would indicate which skip (ore or limestone or coke) was moving up to the dump position; a meter would also record the number of charges dropped.

British Standards Institution

The May issue of the *Information Sheet* of the British Standards Institution lists under "Revised Standards" B.S.416:1957 Cast iron soil, waste and ventilating pipes (sand cast and spun), fittings and accessories, (price 7s. 6d.). An amendment slip has been issued for B.S.2773 Part I:1956 Domestic space-heaters for use with butane gas. Requests for copies should quote PD 2776, and be addressed to the Institution at 2, Park Street, London, W.1.

Company News

JOHN BOOTH & SONS (BOLTON), LIMITED, structural engineers, etc.—Profits advanced from £108,574 to £125,236. The final dividend is being raised by 2½ per cent. to 22½ per cent., to make 32½ (30) per cent. for the year ended March 31, 1957.

G. & J. WEIR, LIMITED—Mr. J. Kenneth Weir, presiding at the annual meeting, said that the results for the first quarter of this year were not up to expectations. He attributed this state of affairs to the strike in March. He hoped, however, that by the end of the year the original output target might be achieved.

METAL BOX COMPANY, LIMITED—The dividend is being raised by 1 per cent. to 11 per cent. with a 7 per cent. final. Sales in the year ended March 31, 1957, increased by £7,500,000, the home group being responsible for £53,130,000 (£47,420,000) and the overseas group for £15,560,000 (£13,800,000). Group profits were slightly lower at £5,745,000 (£5,763,000).

METAL BOX COMPANY OVERSEAS, LIMITED—A proposed 10 per cent. dividend on the capital increased to £2,500,000 is equivalent to the 25 per cent. paid on £1,000,000 previously, but this time there is an additional 5 per cent. bonus. Group trading profits rose from £1,708,000 to £1,862,000, but due to heavier tax provisions, the net profit is down from £971,000 to £920,000.

JOHN SUMMERS & SONS, LIMITED—About 98.8 per cent. of the 4,500,000 £1 ordinary shares offered to shareholders at par were accepted. In accordance with the terms of the offer, the balance of the shares is to be sold and the net proceeds of the sale over subscription price will be distributed in the appropriate proportions to shareholders who failed to take up their provisional allotments or who were entitled to fractions.

ROTARY HOES, LIMITED—The chairman, Mr. E. N. Griffith, states that the board believes it will be able to renew interim dividends next December. The future appears to be brighter and production is rising towards its previous level. With sales some 20 per cent. lower in 1956, group profits before tax, fell from £200,287 to £111,590. The 10 per cent. dividend compares with 13½ per cent. plus a capital distribution of 3 5/6 per cent., not subject to tax.

HATTERSLEY (ORMSKIRK), LIMITED, engineers, iron and non-ferrous founders, of Ormskirk (Lancs)—The layout for the scheme for the £250,000 fully mechanized non-ferrous foundry is now being prepared and it is expected that contracts will be placed shortly. Group trading profits for the year to March 31, 1957, were £613,234 (£722,257). Taxed profit is £318,605 (£377,817) and distribution 32½ per cent. (same). Both works are kept fully employed.

LONDON ALUMINIUM COMPANY, LIMITED—The acquisition of a concern making metal sections was a development which, he thought, held considerable promise, said the chairman, Major C. R. Dibben, at the annual meeting. Motor companies were disinclined to buy sections from one firm and then send them on for brightening. If the company entered that branch of the industry it would be in a position to make its own sections, carrying through with the brightening process.

DANIEL DONCASTER & SONS, LIMITED, makers of forgings, heat-resisting steel castings, etc., of Sheffield—A final dividend of 10 per cent. on a capital doubled by a scrip issue is announced. With a similar interim prior to the capital increase, the dividend represents 15 per cent. for the year ended March 31, 1957, on the present £900,000 in issue. This is equal to a 2½ per cent. increase over the previous year's payment of 25 per cent. on £450,000. Subject to audit the net profit expanded from £250,302 to £306,504.

VILLIERS ENGINEERING COMPANY, LIMITED—Agreement in principle has been reached upon proposals for fusion between the company and J. A. Prestwich Industries, Limited, petrol engine and compressor manufacturers, of Tottenham, London, N.17. Full details are to be published as soon as possible. The capital of J. A. Prestwich consists of £400,000 in 5s. ordinary shares and £339,700 in £1 5½ per cent. cumulative redeemable preference shares, which compares with the Villiers' issued capital of £500,000 in 5s. ordinary shares and £375,000 in £1 5 per cent. cumulative preference shares.

Changes of Name

Among companies which have recently changed their names are those listed below. The new titles are given in parentheses.

RUSSELL (AUCTIONEERS), LIMITED, 1, Springfield Lane, Kilburn, London, N.W.6 (Banklock (Metals), Limited).

SIMPORT, LIMITED, 23, Princes Gate, Hyde Park, London, S.W.7 (Hull Forge Iron & Steel Company, Limited).

DOLMAN-PULLIN PROPELLERS, LIMITED, 56, Bryanston Street, London, W.1 (Robert Dolman (Engineering), Limited).

WATERMAN ENGINEERING COMPANY, LIMITED, 2, Gayton Road, Harrow, Middx (Injection Tools & Mouldings, Limited).

OLDHILL COMPONENTS (COVENTRY), LIMITED, 36, Cannon Street, Birmingham, 2 (Newton Burgoland Engineering, Limited).

PRESS PRINTING METALS (LONDON), LIMITED, 146a, Queen Victoria Street, London, E.C.4 (Press Printing Alloys, Limited).

JOHN K. EDWARDS, LIMITED, engineers, etc., of 1A, Guilsborough Road, Willesden, London, N.W.10 (Microcraft, Limited).

CLEAVER MANUFACTURING COMPANY, LIMITED, Lynden Works, 88, Edward Road, Balsall Heath, Birmingham, 12 (Cleaver Tools, Limited).

GILLETT & JOHNSTON, LIMITED, Norwich Union House, 16/18, Wellesley Road, Croydon, Surrey (Gillett & Johnston Engineering, Limited).

BARRONIA METALS (GREAT BRITAIN), LIMITED, Kent House, Telegraph Street, London, E.C.2 (Clehinger Manufacturing Company, Limited).

ELECTRICAL SWITCHGEAR & ASSOCIATED MANUFACTURERS, LIMITED, 60, Buckingham Palace Road, London, S.W.1. (Metal Industries (Nominees), Limited).

TURNER MANUFACTURING COMPANY (HOLDINGS), LIMITED, Wulfruna Works, Villiers Street, Wolverhampton (Hydraulics & Pneumatics, Limited).

F. J. BULLEN & PARTNERS, LIMITED, ironfounders, etc., of Kent House, Telegraph Street, London, E.C.2 (Barronia Consolidated, Limited).

S. W. HOBDAY & COMPANY, LIMITED, electrical, mechanical and marine engineers, etc., of "Sunnywood," Sycamore Road, Farnborough, Hants (P.C.D., Limited).

BRITISH TWIN DISC & CLARIFIERS, LIMITED, manufacturers of engines, transmission machinery, etc., of Amberley House, Norfolk Street, London, W.C.2 (British Twin Disc, Limited).

Recent Wills

MAITLAND, ROBERT, retired ironfounder, of West Kilbride (Ayrshire) £7,162

TAYLOR, ERNEST, a director of Edmund Taylor & Sons (Stockport), Limited, heating engineers ... £13,397

WESTERMAN, WILLIAM, managing director of Geo. Hy. Hodgson & Company, Limited, steel merchants, of Leeds £13,133

HATTERSLEY, JOHN, a former director of Jonas & Colver (Novo), Limited, steel, strip, and wire manufacturers, of Attercliffe, Sheffield £4,661

GOODYEAR, C. W., founder and former managing director of Steelway, Limited, manufacturers of steel flooring, etc., of Wolverhampton £89,105

BROWN, MALCOLM, a director of Metals & Methods, Limited, Landley, near Slough (Bucks), previously connected with steel firms in Sheffield £54,678

YEOMANS, J. H., chairman and founder of J. H. Yeomans & Sons, Limited, spring manufacturers, etc., of Astwood Bank, Redditch (Worcs) £30,402

Pouring of Investment Castings . . .

. . . *By M. Riddihough, M.Met., A.R.I.C., F.I.M.**

Most of the teething troubles of the investment casting process have now been overcome and high production rates are focusing attention on refinements of technique aimed at improving the yield of good castings. Perhaps because it is out of sight, the actual pouring of the metal does not appear to have received much attention, particularly, as usually it is theoretically the application of the Durville process, which should give a smooth transfer of metal with a minimum of turbulence. The process can be usefully examined in detail by breaking it down into its three components, the furnace hearth, the actual metal transfer and the investment cavity.

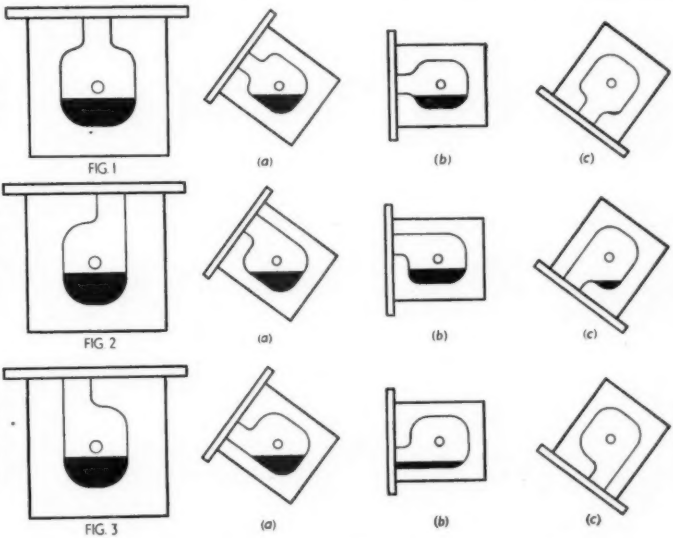


FIG. 1.—*Section through a typical melting furnace for investment casting and three stages* (*a*), (*b*), (*c*) *during its emptying.*

FIG. 2.—*Revised interior design for the melting furnace. Compared with* FIG. 1 *the three positions* (*a*), (*b*) *and* (*c*) *indicate greater speed in the delivery of metal.*

FIG. 3.—*Furnace interior design further modified to give, at* (*a*), (*b*) *and* (*c*), *still greater amounts of metal delivery; emptying being completed after a* 90 *deg. turn.*

Furnace Hearth and Pouring Rate

A typical furnace hearth is shown in Fig. 1. When molten, the metal fills approximately one third of the hearth volume and its position at successive angles of tilt of the furnace during pouring is shown at (*a*), (*b*) and (*c*). No metal issues until the furnace has been tilted through approximately 90 deg. and inversion to 180 deg. is necessary to empty it completely. Once the horizontal position is reached, and the metal starts to run out, the rate of flow is rapid due to the large area of free surface flowing towards the crifice. The rate then diminishes to a final trickle.

The arrangement of hearth shown in Fig. 2 gives a similar result but the metal only commences to pour after a greater angle of tilt and the rate is greater than in Fig. 1 for a given speed of turnover. The design illustrated in Fig. 3 gives quite different results; the metal can be empted by the time the furnace has turned through the first 90 deg.

The optimum rate of transfer of metal into each investment mould depends on many factors, but it is generally agreed that such an optimum does exist and consistent results should be achieved by adhering to it. This obviously points towards mechanization of the furnace turnover which can presumably be attained in a number of ways such as by employing: (*a*) a geared d.-c. motor with variable resistance; (*b*) a constant-speed motor with a lathe-type gearbox; (*c*) a constant-speed motor with a friction disc and axially adjustable take-off drive; (*d*) a variable-speed electric thrustor, or (*e*) a top-heavy furnace (due to the investment mould) tilting at a rate controlled by a hydraulic dash-pot.

In all cases, however, due note should be taken of the angular position at which metal first issues from the furnace. When the hot investment mould is clamped in position, the assembly should be quickly tilted by hand to a "stop" at which the automatic control can take over. A controlled slow rate of tilt for the first 90 deg. in the case of Fig. 1 merely allows the mould temperature to fall unduly.

At this stage, the purist will point out that it is hardly worth while controlling the speed of angular rotation if the rate of flow is also dependent on the shape of the furnace hearth. However, in practice a fairly rapid initial rate of pour is required to fill the runners after which it should diminish to a

* The Author is associated with Deloro Stellite, Limited.

Pouring of Investment Castings

constant rate—a sequence which could perhaps be attained by a suitable design for the crown of the furnace shown in Fig. 1 or 2.

Investment-mould Cavity

The majority of wax-pattern assemblies are based on a central runner, as sketched in Fig. 4, and it is interesting to examine what happens to the metal on pouring this investment from the furnace shown in Fig. 1. As the metal issues from the furnace tilted just past the horizontal, it flows first into the bottom mould cavity and then, as the angle of tilt increases, the other cavities are filled from their base upwards (see Figs. 4 (*a*) and (*b*)). The turbulence experienced in the bottom casting would be removed by placing the runner at the side of the investment so that all castings were filled from the base upwards as at Fig. 4 (*c*) and (*d*).

Persistence in eliminating such variables from the investment casting procedure will soon complete its transformation from an art to a controlled engineering process and one finding increasing favour in the minds of designers.

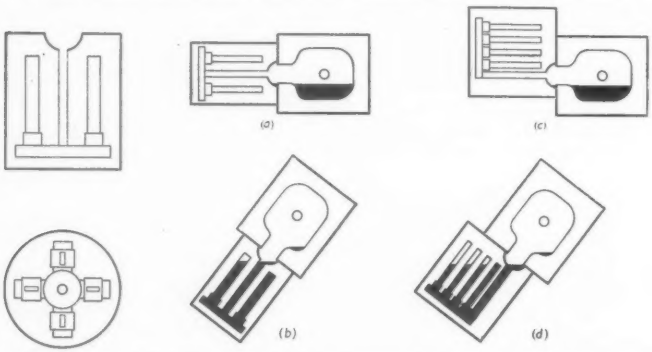


FIG. 4.—*Diagrammatic representation of the reduction of turbulence which can be secured if an investment type of mould is run at the side instead of at the centre.*

Blast Penetration from Tuyeres

Although there is considerable interest among blast-furnace and cupola operators on air penetration into the furnace through the tuyeres there is still uncertainty as to how far the blast does, in fact, penetrate. Moreover, it is not always clear just what penetration meant in this sense. It has been found by various investigators that at the end of each tuyere there is more or less of a void, where charge particles are blown around by the force of the blast. Also it is well known that if a bar is pushed into a furnace through a tuyere it will penetrate easily a distance of some 3 to 4 ft. before coming up against firm resistance. It is apparent that the bar penetrates across the width of the raceway before coming up against the lower part of the "dead man". Thus the penetration of the bar corresponded approximately to the diameter of the raceway. Further, it has been found that the raceway is approximately spherical in shape.

More recently two independent studies have been made. In the first, further work on models has led to an improved correlation, and in the second, a large number of measurements of raceway size were made at the Steubenville plant of Wheeling Steel Corporation. The data were obtained by rodding all tuyeres of each of five blast furnaces at frequent intervals, usually hourly. In this way, more than 3,000 measurements of individual raceway sizes became available. A report discussing and comparing these two studies has been prepared by J. B. Wagstaff and W. H. Holman and published in the (American) *Journal of Metals*.

The authors state that earlier studies of raceways in small models were restricted to observation of a single jet, and its raceway in a model rectangular in plan. Since raceways seem to be about as wide as they are long, there was some question as to the applicability of the earlier work to the blast furnace that has many tuyeres arranged around the circumference of a circle so that the raceways might overlap. Experiments were therefore carried out with models shaped, in plan, like a segment of a circle. The jets in the model were arranged so that one of them, and its raceway could be observed directly. The other three jets were arranged so that the middle one was between two normally operating raceways and any interference would be the same as that in a completely cylindrical model. As a result of these studies, and of a further review of the earlier work, a new correlation for raceway size was obtained.

Discussion of Results

Discussing the results of the investigation the authors state that once model results are accepted as applicable to the furnaces, the effect of different variables on raceway size can be calculated. Although as yet they say there is no evidence on the optimum raceway size, their work has shown that changing to larger tuyeres may produce a considerably smaller raceway in one case and make little or no change in another. The agreement between the model work on raceway size with the measurements taken on a blast furnace is considered to be remarkable. The model work is, of course, all carried out without combustion and the enormous release of energy at the tuyeres in an actual furnace might be expected to affect the raceway size. Possibly there is some cancellation of different effects but it would seem that data from the model cannot be far wrong, and is considered to be an important development.

Fume Extraction from Arc Furnaces

*By J. Bain**

The problem of fume emissions from high-frequency and arc melting furnaces is a serious one in many foundries, due to the fact that the effluent escapes into the foundry building and is not discharged outside as is the case with many other melting units. Various general methods of clearing the air are employed, such as roof ventilators, fans, side hoods, top hoods with or without fans, etc. The efficiency of these devices, however, is greatly affected by air currents within the foundry buildings and in many cases the opening of a door is sufficient to blow the fumes and dust through the shop. Given suitable weather conditions, their escape through efficient ventilators is fairly rapid, but on still, humid days, atmospheric conditions inside a building can rapidly become most unpleasant and visibility, particularly for crane drivers, is considerably reduced.

Statement of the Problem

The problem is most serious in the case of swing-roof furnaces, as collecting hoods must be arranged some distance from the furnace to allow access to the crane carrying the charging device. The only really efficient way of tackling the problem is to deal with the fumes as near to their source as possible instead of trying to trap them after they are partially dispersed. This is being done commercially in two ways:—

(1) By attaching a casing directly on to the furnace roof and extracting from this.

(2) By drawing the fumes directly from the furnace through a side opening above the level of the metal—it is this latter method which is described in what follows.

Existing Installation

To the best of the Author's knowledge only one furnace† has been equipped in this country and this has now been in operation for six months; two further units are now being manufactured for the same foundry. Doubts were first held as to the effect on the body and roof brickwork; the electrode and current consumption; and also on the quality of the metal melted. In the early stages, the opinion of the furnace manufacturers was sought and their advice and help throughout proved most valuable. Whilst all the facts are not yet available, as far as can be ascertained, when employing the side-extraction plant, there is no difference in current consumption or melting time; no shortening of the life of the lining is apparent, but there is an increase in consumption of electrodes, although this is not serious when related to the cost per ton of castings.

The really heavy periods of fume discharge from a steel-melting furnace come at the initial boring down of the charge, and again during the oxygen-injection period. The new extraction system is kept in operation for the whole of a melt, except during refining; no change has been found in metal composition.

Fig. 1 shows the arrangement of the plant in elevation. An opening is cut in the furnace body into which is inserted a water-cooled connection leading to the junction box. A sheet-steel hood is positioned over the slagging door with a duct to the junction box. This box is fitted with an adjustable side-plate which can be set to allow cooling air to mix with the hot gases. The rest of the arrangement consists of a fan and duct to the cleaning plant. A make-and-break joint is introduced in the duct to allow for the tilting of the furnace and the entry of cooling air here—together with that entering at the hood and junction box—is sufficient to cool the gases enough to be handled by the fan and cleaning plant. Fig. 2 shows a plan view of the arrangement. It will be noticed from these illustrations that the only connections are made to the side of the furnace and that all the equipment is clear of the swinging roof, thus operation of the furnace is not obstructed in any way.

Other Considerations

Having little data available, many assumptions had to be made for the original design. An attempt was made to limit the amount of air handled, so that cold air would not be drawn in through the electrode openings, even though this might be at the expense of some leakage of fumes at these points. This state of affairs appears to have been achieved, as a small amount of fume escapes at times, though this is negligible. It is not known at this stage if a greater rate of extraction could be achieved without upsetting the balance in the furnace but no doubt further data will become available as more plants are installed.

Disposal of the Fumes

The foregoing completes the description of the extraction plant and it is pleasing to note that the desired result has been achieved. Conditions inside the foundry are visibly better and the smoke fumes and dust have been effectively removed. Next comes the problem of what to do with them! Tests show that although some heavy particles of dust are present, the bulk of the solid matter is considerably under the two-micron size, which is extremely difficult to collect in a wet-type cleaner of reasonable proportions and cost.

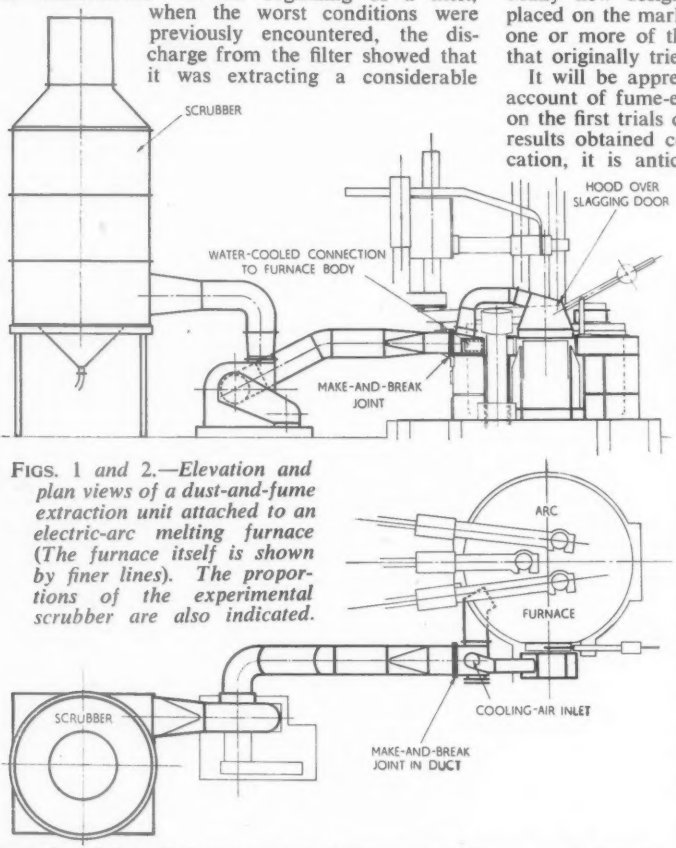
In most cases, it would be sufficient to discharge from the fan into a fairly tall chimney as particles of this size would disperse into the outside atmosphere over a very large area. With the Clean Air Act in mind, it was decided to try out a filter consisting of beds of wet porcelain cylinders constantly washed down with water sprays.

* The Author is associated with Paterson Hughes Engineering Company, Limited.

† Since this article was prepared another unit has been installed, in a steel foundry near London—Editor.

Fume Extraction from Arc Furnaces

The general proportions of the unit are shown in the illustrations. At the beginning of a melt, when the worst conditions were previously encountered, the discharge from the filter showed that it was extracting a considerable quantity of dust. Laboratory tests, however, proved that the overall efficiency was fairly low, though the fumes escaping consisted of particles of 1.75 microns and under.



FIGS. 1 *and* 2.—*Elevation and plan views of a dust-and-fume extraction unit attached to an electric-arc melting furnace (The furnace itself is shown by finer lines). The proportions of the experimental scrubber are also indicated.*

Further experiments are proceeding with a view to increasing the efficiency of the existing plant for cleaning the gases extracted, though it is felt that the only positive method would be by electrostatic precipitation. This would be very costly and it is hoped that a more economical way will be found. Many new designs of wet collectors have been placed on the market recently and it is possible that one or more of them may be more effective than that originally tried.

It will be appreciated by readers that this short account of fume-extraction plant is really a report on the first trials of a new design and although the results obtained conformed to the original specification, it is anticipated that much better results will be obtained in the future.

ADDENDUM

At a meeting of the London branch of the Institute of British Foundrymen, Mr. Bain replied to questions concerning the efficiency of the equipment described above and the following extract from the discussion contains the additional information disclosed:

A SPEAKER from Glasgow said he was experiencing the same difficulty with fumes from arc furnaces, and this was the first time he had heard that anyone had done anything really constructive about it. He asked Mr. Bain what type of material was being melted in the furnace, the rate of oxygen input during the blow, or the drop in carbon percentage, and the size and cost of the installation.

MR. BAIN replied that, not being a metallurgist, he did not know how much oxygen was used. The equipment he had described was installed on a five-ton furnace. The material being melted was both manganese steel and a very accurately controlled mild steel to produce ingots suitable later for deep drawing operations. The cost of the equipment depended much on the layout of the shop, because of the ducting, and so on. It would be about £3,500, but more than half of this was covered by the cost of the wet arrester.

Increases in Capital

NORTHAMPTON FOUNDRY COMPANY, LIMITED, Northampton, increased by £20,000, in £1 ordinary shares, beyond the registered capital of £10,000.

FAIRWAY ENGINEERING COMPANY, LIMITED, Walkden, Manchester, increased by £45,000, in £1 ordinary shares, beyond the registered capital of £5,000.

SAMUEL HODGES & SONS, LIMITED, engineers, etc., of Rainham (Essex), increased by £250,000, in £1 ordinary shares, beyond the registered capital of £250,000.

ORIENTAL TUBE COMPANY, LIMITED, engineers, etc., of West Bromwich, increased by £190,000, in £1 ordinary shares, beyond the registered capital of £10,000.

BEASLEY FRENCH & COMPANY, LIMITED, ironfounders, engineers, etc. of Bedminster, Bristol, increased by £25,000, in £1 shares, beyond the registered capital of £57,600.

W. P. BUTTERFIELD, LIMITED, tank manufacturers, etc., of Shipley (Yorks), increased by £450,000, in 5s. ordinary shares, beyond the registered capital of £300,000.

GRAVESEND WELDING & ELECTRICAL ENGINEERING WORKS, LIMITED, Gravesend, increased by £25,000, in £1 preference shares, beyond the registered capital of £5,000.

DUNFORD & ELLIOTT (SHEFFIELD), LIMITED, iron merchants, etc., of Sheffield, 9, increased by £275,000, in 5s. "A" ordinary shares, beyond the registered capital of £300,000.

HARVEY & COMPANY, LIMITED, steam, hydraulic, electrical, mechanical, and general engineers, etc., of Hayle (Cornwall), increased by £60,000, in £1 ordinary shares beyond the registered capital of £240,000.

P. H. MUNTZ & BARWELL, LIMITED (formerly P. H. Muntz & Company, Limited), brass and copper tube manufacturers, of cumulative preference and 10,000 ordinary shares of £1 each, West Bromwich, increased by £12,500, in 2,500 5 per cent. beyond the registered capital of £125,000.

Book Reviews

Design of Grey Iron Castings, by A. Scharf and Chas. F. Walton. Published by the Gray Iron Founders' Society Inc., 930, National City, East 6th Building, Cleveland 14, Ohio; price $1 to members ($5 non-members). Also available in the UK from the Penton Publishing Company, Limited, 2, Caxton Street, Westminster, London, S.W.1, prices, including postage, 11s. and £2 0s. 6d. respectively.

This is a very readable little manual and is refreshing in its whole outlook. The subject matter is usually productive of much "woolly" thinking, but the authors here have produced a logical guide and give one the impression of being gently taken by the hand and led along an interesting path instead of a tangled maze.

The trend towards specialization among foundries is emphasized, and the importance of selecting foundries best suited to the design, specifications and purchasing conditions is pointed out. This trend, although well recognized in the UK, is often overlooked in the final decision when placing orders for castings of certain design.

There is a good introduction to the subject matter, clearly indicating what a foundry can do, and what should be expected from the application of founding skill; the designer is told that he should not avoid complexity if he wishes to take full advantage of the casting process, but should incorporate it into his ideas. It is stated that iron casting design can be approached with confidence, and a sound catechism of design sequence is given. One cannot help preferring this method of approach to the more usual system of "don't do this" and "avoid that," and here the authors show that they have their "feet firmly on the ground." It is surprising to find an absence of typical engineering drawings in the text and interesting to compare the book in this respect with that on the same subject of French origin, recently reprinted in English by the Council of Ironfoundry Associations. This absence is explained in the authors' paragraphs on techniques in styling, where they point out that it is easier to understand the arrangement and functioning of a casting from mechanical drawings than to visualize its appearance, and the best study of appearance is with a scale model. Consequently, the book has photographic illustrations of all the salient points.

The chapter on the properties of cast irons is very clear, and here again an outline method for a design sequence is given. The paragraph referring to factors of safety relating to design, unfortunately, is vague and open to criticism, since the figures given are optimistic for normal cast irons; this is a small point, however, and should not materially detract from the value of the chapter. There is no doubt that the designer would find the chapter on properties clearer to understand than the corresponding pages in the French publication referred to earlier.

There are commonsense comments on casting inspection and an interesting selection of "Design Tips." It would have been useful to see the authors' results of combining illustrations (1) and (1(a)), where two design points of view are shown, but readers are left to deduce the final shape adopted. The book has a useful list of additional sources of information and in the reviewer's opinion should be read before studying more elaborate publications on the same subject.

A. D. M.

One Hundred Years of Good Company, by Bernard Newman. Published for private circulation on the occasion of the centenary of Ruston & Hornsby, Limited, Lincoln.

Ruston & Hornsby were indeed fortunate in getting Mr. Bernard Newman to write their history. The eminence of an author, *per se,* is no guarantee that the result will be acceptable and more than one instance can be recalled of failure. One, for example, had documentary references on almost every page, which greatly detracted from its readability; another, written by a really eminent novelist, seemed merely to contain sub-edited material prepared by the works staff. Bernard Newman has always been an objective writer, and an expert in squeezing information from people, and other sources, to be converted in his own way into really interesting reading matter—for even if he "lifts" matter from a local guide-book, it is so much better presented. Thus, the book opens with a talk in a barber's shop in Sheffield between the barber and the true founder of the company, Joseph Ruston, who was then in the cutlery trade, after being educated at Wesley College. The barber spoke of an opening for a partnership with Burton & Proctor, millwrights and general smiths of Lincoln. This was in 1856, and on January 1, 1857, a partnership was established and so the foundation stone of this great enterprise was laid. At the end of the book, the author makes a series of acknowledgments and the extent to which he is indebted to these various sources is well illustrated by his description of the Beevor Foundry. This is written in popular style, but it is technically without blemish. To say of the long history of a large engineering works that the author gets and maintains the interest of his readers throughout is indeed high praise, but Mr. Newman well merits the approbation in this case.

Publications Received

Physical Properties of the Nickel/Iron Alloys. Issued by the Mond Nickel Company, Limited, Thames House, Millbank, London, S.W.1.

This well-illustrated 22-page booklet commences with reports on the early investigations carried out on nickel/iron alloys, dating back to the year 1751 when the Swedish metallurgist, Cronstedt, discovered that nickel could be alloyed with iron in all proportions. The general characteristics of these alloys, including their mechanical properties, resistance to corrosion, electrical and thermal properties, are next discussed. The booklet goes on to give the dilatational properties of the binary alloys and other commonly-used alloys having special expansion characteristics. Included also is a section on ternary alloys, and constant-modulus alloys, together with their applications.

Technical Report. New Series, Vol. III. Published by the British Engineer Boiler & Electrical Insurance Company, Limited, 24, Fennel Street, Manchester, 4; price 15s.

Whilst over 25 failures to plant are covered in the contents of this volume, it is interesting to note that none refers to castings. There was a time, some 30 years ago, when failure of cast-iron flywheels figured quite prominently in these reports. Two cases are dealt with concerning the fatigue failure of surface-treated crankshafts, but in neither case was a casting involved. The case-histories reported certainly make interesting reading.

Personal

Mr. I. M. STEWART and LORD BRIDGES have been appointed directors of Babcock & Wilcox, Limited.

Mr. E. EUGENE OLSON has been appointed sales director of Shallway International Corporation, Palo Alto, California.

Mr. W. O. GASCOIGNE has resigned his position with Rolls-Royce, Limited, Derby, to become area sales manager of Ariston Alloys, Limited, Croydon.

Mr. J. P. HATFIELD, formerly on the staff of George Cohen, Sons & Company, Limited, has been appointed manager of the machine-tool department of Newman Industries, Limited, Bristol.

At the annual general meeting of Guest Keen & Nettlefolds (Cwmbran), Limited, held last month Mr. A. T. JOHNSTON, general manager, and the Hon. R. G. LYTTELTON were appointed directors of the company.

Dr. S. R. M. ELLIS has been appointed to the vacant Chair in the Department of Chemical Engineering at Birmingham University with effect from May 1. Dr. A. D. MCQUILLAN has been appointed to the research Chair in Physical Metallurgy at the same university, with effect from October 1.

Mr. J. S. MOFFAT has been appointed representative for London and south-east England of Robert Harlow & Son, Limited, valve manufacturers and brass-founders, of Stockport. The new address of the company's London office is 10, Norfolk Street, W.C.2 (telephone: covent Garden 0315/6/7).

High Duty Alloys Limited, have announced the appointment of Mr. W. H. BOWMAN, M.I.MECH.E., to the board of directors. Prior to this appointment, he was a director of T. I. Aluminium Limited, and was responsible for the construction of their rolling mill in South Wales. He was also a director of the Aluminium Wire & Cable Company, Limited.

Mr. IAN MACLEOD SMITH, who has been appointed sales manager of W. H. Dorman & Company, Limited, manufacturing engineers and ironfounders, of Stafford, will be accompanying the managing director and general manager, Mr. J. W. WHIMPENNY, on a visit to Venezuela shortly. Mr. Macleod Smith, who has travelled extensively in business, speaks five languages, and has visited some 55 countries all over the world.

Mr. H. B. TOPHAM has been appointed a director of the Anglo Great Lakes Corporation, Limited, one of the subsidiaries of C. A. Parsons & Company, Limited, engineers and turbine makers, of Newcastle-upon-Tyne. The company was formed by four member companies of the Nuclear Power Plant Company, Limited, in collaboration with the Great Lakes Carbon Corporation of New York, to produce nuclear graphite in a new factory which is being built on the Tyne.

Mr. C. J. FLETCHER, a director of Chamberlain Industries, Limited, structural engineers and machinery merchants, etc., of Leyton, London, E.10, is visiting the works of Jenbacher Werke, Jenbach, Austria, manufacturers of the Jenbach compressor, for which Chamberlain Industries is sole agent in this country. During his visit Mr. Fletcher will discuss recent modifications widening the scope of this machine and will also survey the Austrian market for the sale of the "Staffa" range of mobile and shop cranes.

Mr. F. W. AUSTIN, formerly branch manager at Dundee, has been appointed Scottish area manager of the Ransome & Marles Bearing Company, Limited, Newark-on-Trent, with effect from July 1. His assistant will be Mr. E. H. WARD. Mr. Austin will succeed Mr. J. T. MORE who has been Scottish representative for 35 years, and who is to retire. These representatives will be based at new offices at 380, Argyle Street, Glasgow. Mr. W. L. DRISCOLL will continue to supervise the Dundee office at 310, Perth Road.

Mr. O. G. VOSS, managing director of the International Harvester Company of Great Britain, Limited, left by air recently for a trip to Canada and the United States. His dual mission is to further promote the sale of IH British products in the export market and to finalize plans for the manufacture of new and additional IH products in Britain. The company's export figures for the first seven months of this fiscal year showed a 78 per cent. increase over the same period in 1956, when over 50 per cent. of all their machine sales were in the export field. The company expects 1957 dollar sales to exceed $3,000,000.

Foundry Services, Limited, announces the following appointments: Mr. M. W. BARLOW, L.I.M., becomes Northern Regional sales manager. He joined the firm in 1950 and has for the past four years been representative in the north-east coast area. Mr. R. S. BUSHNELL is the new Midland Regional sales manager, and also acting Southern Regional sales manager. He was formerly with Catalin, Limited, and British Industrial Plastics, Limited, where he was engaged in the development of technical sales and service of foundry resins, and joined Foundry Services in 1956; Mr. ARNOLD DEY will be taking over as the firm's representative in the North-East Coast territory, based in the Newcastle-upon-Tyne area. Previously, with Newton Chambers & Company, Limited, and the Butterley Company, Limited, Mr. Dey joined Foundry Services early last year as senior technical officer.

Obituary

Mr. WILLIAM JAMES HILLING, Glasgow manager of Laurence, Scott & Electromotors, Limited, has died at the age of 53.

Mr. E. E. LAKE, former proprietor of the iron foundry in Victoria Street, Newport, Barnstaple, Devon, has died at the age of 89.

Mr. GEORGE ROBERTS, who was a director of Roberts, Black & Company, Limited, machine-tool manufacturers, of Manchester, died on June 9 at the age of 68.

Mr. F. A. HALL founder, chairman, and managing director of Ductile Steels, Limited, Willenhall, died on June 10 at the age of 65. He was also a director of A. P. Metalcraft, Limited, of Shipston on Stour, and of Dynea Steel, Limited, Swansea.

Mr. NORMAN DENNY JOHNSTONE, who had served on the national executive of the Association of Engineering and Shipbuilding Draughtsmen, of which he was national president in 1925-26, died on June 12. Mr. Johnstone, who was mayor of Rugby in 1945-46, was a member of the town council for 22 years.

Mr. JAMES PRATT, who was the elder managing director of Pratt, Levick & Company, Limited, precision ground steel, brass rod, and bar manufacturers, of Chester, and a director of Rubery, Owen & Company, Limited, structural and manufacturing engineers, of Darlaston (Staffs), has died at the age of 77.

New Patents

(Copies of complete specifications are obtainable from the Patent Office, Sales Branch, 25, Southampton Buildings, Chancery Lane, London, W.C.2, price 3s. 6d.)

773,978. Kokichi Otani, No. 28 Gazenbo-cho Azabu, Minato-ku, Tokyo, Japan.

A mould for casting chilled cast metal. The mould has a chill portion comprising a kneaded mixture of the metal, *e.g.* iron or copper in the form of granules or powder and a cooling accelerating agent, such as common salt, borax or boric acid.

774,138. Kinzoku Zairyo Kenkyucho, Tohuku University, No. 75 Katahira-cho, Sendai City, Japan.

Improvements relating to a method of reduction refining of cast iron, alloy cast-iron, and hypereutectoid carbon and alloyed steels having short-flake graphite or nodular structure. The major proportion of the reducing slag consists of one or more of oxides, carbonates or fluorides of alkali metals or alkaline earth-metals, and one or more of carbon, silicon or aluminium in an amount of one half to one fiftieth of the weight of the oxides, carbonates, etc. The contents of the slag are intimately admixed and finely pulverized to a grain size of at the most 0.5 mm.

774,184. Shaw Processes, Limited, 41, Carlisle Street, Newcastle-on-Tyne.

A modification of the inventors co-patent, No. 716,394, for a method of producing refractory moulds for the production of high-precision castings. A pattern is coated with a superficial layer of a paste or slurry consisting of a comminuted refractory material and hydrolyzed ethyl silicate. The rest of the mould is formed from ordinary foundry sand. When the ethyl-silicate mix has set sufficiently to strip the mould, this layer is ignited to burn off the alcohol. The layer of ethyl silicate is of sufficient thickness to protect the foundry sand foundation from disintegration by molten metals at high temperatures.

774,242. Eisenwerke Gelsenkirchen AG., Hohenzollernstrasse 2-4, Gelsenkirchen, Germany.

Apparatus for feeding molten metal in the continuous casting of pipes or similar hollow bodies.

774,287. Metropolitan Vickers Electrical Company, Limited, St. Paul's Corner, 1-3, St. Paul's Churchyard, London, E.C.4.

In the manufacture of a casting by a vacuum process, a shell mould of permeable ceramic material is placed within an evacuable container. A thin diaphragm is placed so as to extend across a pouring throat for the entry of the casting material to the interior of the mould. The diaphragm supports within the throat a volume of the material. It is of a material which melts under the heat of the casting metal and is of such an area as to allow, on melting of the diaphragm, the rapid entry of the metal into the mould, under the action of the vacuum in the permeable shell-mould. The fusible diaphragm prevents air entering the mould whilst it is being evacuated. This method, it is claimed, enables dense, well-defined castings to be obtained.

774,344. Electric Steel Foundry Company, 2141 North West 25th Avenue, Portland, Oregon, USA.

In the centrifugal-casting process for forming a casting in a mould, when molten metal is poured into a rotating metal mould to form the casting, an exothermic material is introduced into the interior of the molten casting. This coats the interior of the casting, with the object of producing a casting with a sound wall-section and substantially free of porosity.

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News in Brief

THE MAGAZINE *Canadian Metals* has changed its name to *Canadian Metal Working*.

THE MODEL ENGINEER EXHIBITION is to be held at the New Horticultural Hall, Westminster, S.W.1, from August 21 to 31.

TO BUILD larger tankers at Sunderland, Joseph L. Thompson & Sons, Limited, is to construct a 900-ft. berth at a cost of about £750,000.

HONEYWELL-BROWN, LIMITED, have moved their Manchester branch office to larger premises at: Warsall Road, Northenden, Manchester, 22.

TWENTY STUDENTS from Derby and District College of Technology, recently toured the works of F. Perkins, Limited, diesel-engine manufacturers of Peterborough.

MORE THAN 3,000 SCHOOLBOYS from 110 schools in the Midlands attended a Rolls-Royce, Limited, schoolboys' exhibition at Derby over the weekend, June 13 to 14.

TO DEAL WITH the servicing of trawlers fitted with the company's engines, Mirrlees, Bickerton & Day, Limited, Stockport, has opened a new servicing depot at Grimsby.

Major H. G. FREEMAN, a director of Hadfields, Limited, Sheffield, welcomed three members of a Chinese youth delegation in this country, when they toured the works on June 4.

EDGAR ALLEN & COMPANY, LIMITED, announce the appointment as senior representative in South and West Yorkshire, North Lincolnshire, etc., from May 1, of Mr. J. T. Wells, M.ENG., A.M.I.MECH.E.

A CONTRACT worth £600,000, for the supply of 18 diesel-electric shunting locomotives, has been given to the British Thomson-Houston Company, Limited, Rugby, by the Government of New Zealand.

THE DOHM GROUP announce that sales offices are being opened in Basle, Vienna, Milan, Frankfort, and another German city yet to be chosen, and Treasury permission to transfer capital has been granted.

Lord DUDLEY GORDON, chairman of Hadfields, Limited, Sheffield, made presentations, on June 7, to three men who have completed 50 years' service with the firm. They were each presented with a walking stick.

RADCLIFFE ENGINEERING COMPANY, LIMITED, has acquired a controlling interest in the 77-year-old iron-founding firm of James Clitheroe & Sons, Limited, Blackburn, Lancashire, which is equipped to produce castings of up to 2½ tons.

WEATHERFOIL, LIMITED, 185, Bath Road, Slough, Bucks, announce that a new office building is in the course of construction to house their newly-created air-treatment division; it is expected to be ready for occupation early in September.

PREMISES ADJOINING ITS WORKS at Springfield Road, Grantham (Lincs), lately occupied by the Ransome & Marles Bearing Company, Limited, Newark (Notts), are to be taken over by the British Manufacture & Research Company, Limited, precision engineers.

BRITISH ROAD SERVICES announces that it has reached agreement with the trade unions concerned on the measures designed to take advantage of the new regulations now in force which increase the permissible speed of heavier goods vehicles from 20 to 30 miles an hour.

A NEW BRANCH DEPOT has been opened in Salisbury, Southern Rhodesia, by the David Brown group. It will cover the products of David Brown Precision Equipment (Pty.), Limited, Benoni (Transvaal), and David Brown Tractors S.A. (Pty.), East London (Cape Province).

INFORMATION about the early history of the Vulcan Foundry, Newton-le-Willows, Lancashire, established by Robert Stephenson and Charles Tayleur under the name of Charles Tayleur & Company, is sought by Mr. L. J. Smith, of 10, Thyra Grove, North Finchley, London, N.12.

A 20,000-TON PASSENGER LINER is to be built at the Neptune shipyard of Swan, Hunter, & Wigham Richardson, Limited, for the Companhia National de Navegacao of Lisbon. The contract is estimated to be worth £5,000,000. The ship will be the biggest ever built at the yard.

APPROXIMATELY 100 TECHNOLOGISTS from this country have registered their intention to attend the second World Metallurgical Congress to be held at Chicago from November 2 to 8. Included in the list are the heads of a number of national and private research establishments.

PLANS FOR A DEVELOPMENT SCHEME, estimated to cost £250,000, at the shipyard of the Greenock Dockyard Company, Limited, have been prepared. The scheme will consist of a stockyard with three bays, and a two-storey block fronting the main thoroughfare to accommodate a moulding loft and workshop.

A PRIVATE LETTER from Mr. John Cameron contains the information that the boys at Oundle School have constructed a 10-in. dia. cupola, which has proved quite efficient and well suited for making small quantities of cast iron, of which only about 56 lb. or so on any one occasion is required.

Mr. E. F. HODGES has severed his connection with J. Stone & Company (Charlton), Limited, and set up in business as an independent consultant, with special reference to non-ferrous foundrywork and precision investment casting. He is now operating from 32, Victoria Street, London, S.W.1. Tel.: ABBEY 7681.

CHAMBERLAIN INDUSTRIES, LIMITED, Staffa Works, Staffa Road, Leyton, London, E.10, announce that they have appointed H. B. Rayler & Company, Limited, of Thomas Street Works, Hull Road, York, and Victoria Street, Newport Road, Middlesbrough, to act as their agents for the sale of the Jenbach portable diesel air-compressor.

AITON & COMPANY, LIMITED, pipework engineers, of Derby, held a celebration dinner at the Midland Hotel, Derby, to mark their jubilee. The guests included the Mayor of Derby (Councillor Walter White) and many leading industrialists. Wing-Commander J. M. Aiton, chairman and managing director of the company, presided.

GUEST OF HONOUR and chief speaker at the next trade luncheon of the Gauge and Tool Makers' Association will be the President of the Board of Trade, Sir David Eccles. The luncheon will be held at the Savoy Hotel, London, on September 25. The association's annual dinner-dance will be held at Grosvenor House, London, on October 24.

NEARLY 10,000 RAILWAY WAGONS have been ordered from the Pressed Steel Company, Limited, Linwood, Renfrewshire, by the British Transport Commission to meet their 1957-58 programme. Of £6,000,000 worth of contracts for rail freight wagons recently placed by the Commission, £5,000,000 worth has gone to the Pressed Steel Company.

(Continued on page 770)

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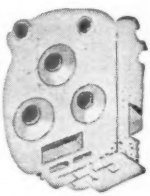

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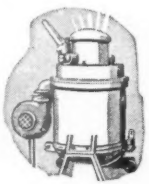

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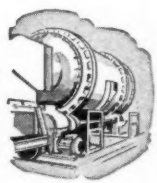

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News in Brief

(*Continued from page 768*)

SHOWER-ROOMS and washing facilities have been installed at the Portwood, Stockport, foundry of J. Needham & Sons, Limited, Carrington Road, Stockport. Heated lockers for drying wet clothes are also provided. The new shower-rooms, formerly a printing office, were opened on June 12 by His Worship the Mayor of Stockport (Alderman F. Cross).

AN EXTENSION to its Wednesfield factory was opened earlier this month by the Yale & Towne Manufacturing Company, materials handling equipment manufacturers. By increasing many of its facilities the company expects to double production, before the end of the year, of its more powerful fork-lift trucks with capacities of up to 10,000 lb.

IN ORDER that there shall be adequate British representation at the Brussels World Fair next year, the Birmingham Engineering Centre is organizing a group stand for the metalworking industries. It is hoped that in this way, it will be possible for manufacturers, and especially small firms, to take part at a reasonable cost in an important international exhibition.

LATEST ADDITION to the Rootes Group museum at Ryton on Dunsmore is a 9-ft. winged angel in bronze, won by Sunbeam cars in the 1912 French *Grand Prix* and the *Coupe de l'Auto*. The trophy, which is said to have cost £550, originally belonged to Mrs. Ivy Mary Barclay, daughter of Thomas Cureton, co-founder and later chairman of the Sunbeam Motor Company, Limited.

THE BLACKHEATH, Staffs, firm of Firth Vickers Stainless Steels, Limited, is now a completely self-controlled unit so far as production and sales are concerned. Until recently, the foundry side of the work was under the general control of the central organization at Sheffield. Mr. G. H. A. Cordwent, a special director of Firth Vickers for many years, is the general manager at Blackheath.

THE ANNUAL CONFERENCE of the foremen and supervisors in the employ of F. H. Lloyd & Company, Limited, was held at Stratford-upon-Avon during the morning of June 15, the theme being "Company Policy." The members were joined by their ladies as guests of the company for luncheon at the Shakespeare Memorial Theatre and afterwards saw a performance of "Julius Cæsar."

AN ORDER has been received by Vickers-Armstrongs (Engineers), Limited, from the Service Technique Militaire of the Federal Swiss Government for the supply of 100 Centurion tanks and 10 armoured recovery vehicles. Switzerland has increased her rearmament effort recently for purely defensive purposes. Vickers-Armstrongs last received an order for 100 Centurion tanks from the Federal Swiss Government in 1955.

NEXT YEAR the first great universal and international exhibition since that in New York in 1939 is to be staged in Brussels. Under the auspices of its association, the Agricultural Engineers Association, the British agricultural engineering industry is to be represented and special transparencies will illustrate over 100 aspects of the industry. The AEA stand will be in the British Industries pavilion, which is being organized by the Federation of British Industries.

A VISIT OF INDUSTRIALISTS, together with members of the Cutlers' Company, which was to have taken place at the time of the Cutlers' Feast, but was postponed because of the engineering strike, took place on June 19. The party was invited by the Master Cutler, Sir Peter Roberts, M.P., chairman of Newton Chambers & Company, Limited, to tour the works of the firm. Among the guests were the Lord Mayor of Sheffield, Alderman A. Ballard, and the president of the Sheffield Chamber of Commerce, Mr. D. J. Haggie.

THE FOUNDATION STONE of a new staff and works school of Crofts (Engineers), Limited, at Bradford Moor, Thornbury, Bradford, was laid on June 14 by Lady Croft, wife of Sir Arthur Croft, chairman of the Crofts group of companies. Sir Arthur said that in the school it was intended to instal the type of teaching best suited for the training of their apprentices with a view to them, in time, helping to man the company's workshops. He hoped that all the students who passed through it would look back to the training they received and say the time was well spent.

IN COMPETITION with British and foreign manufacturers, Bruce Peebles & Company, Limited, Edinburgh, have obtained a £250,000 order for three 90,000 kva. transformers for the Magill sub-station of the Electricity Trust of South Australia. The transformers are for connection to the Adelaide end of the 275,000 v. transmission lines from Port Augusta power station and will feed into the Trust's 66,000 and 11,000 v. metropolitan system. Weighing about 200 tons each in their completed operative condition, the transformers will be the largest three-phase units installed in Australia.

Mr. CHARLES MONCKTON, Master of the Armourers' and Brasiers' Company, presented awards to 24 people at the 32nd annual distribution of certificates and prizes, under the Armourers' and Brasiers' scheme, in the Cutlers' Hall, Sheffield, on June 14. He was accompanied by the clerk, Mr. Hewitt Pitt, and the Master Cutler, Sir Peter Roberts, M.P., presided. The Master Cutler presented 15 certificates to members of the Sheffield University special lecture course in boiler management, and seven certificates to Fellows of the National Trades Technical Societies. He said that the scheme, which is administered in conjunction with the Cutlers' Company, Sheffield University, and the Sheffield section of the National Trades Technical Societies, showed that the old guilds of the past were able to help in the practice of the future.

Lincolnshire Puts in Claim for Steel Mill

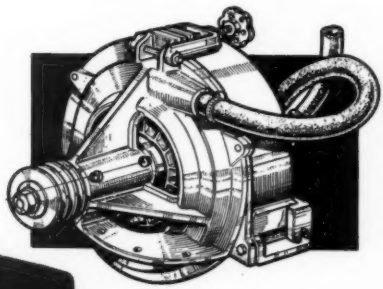
Lincolnshire's claim to the steel strip mill planned by Richard Thomas & Baldwins, Limited, was put to the Prime Minister on Thursday, June 6. This, the third deputation to see Mr. Harold Macmillan on the subject, consisted of Mr. Kenneth Younger (Lab.), Mr. Cyril Osborne (Con.), and Mr. Marcus Kimball (Con.). They suggested a site at Immingham for the steel mill.

In Scotland recently Mr. George Middleton, secretary of the Scottish TUC, called for the "clamour for a steel strip mill in Scotland to be raised to the highest possible heights." Unless they got more steel production they were not going to get the economic growth which Scotland required, he said. Scotland's sheet steel production was only 75,000 tons out of a total steel production of 2,250,000 tons. It was this small proportion of sheet steel production that played such a big part in the failure to attract an adequate share of new industry to Scotland. If the steel mill was sited in Scotland, the economy of the country would be assured for the next 50 years, he said.

Last week, the General Council of the Scottish TUC expressed encouragement on learning that, in the view of the Prime Minister, the project was still "in the very formative stage," and that Scotland's case for the allocation of the mill would be fully investigated.

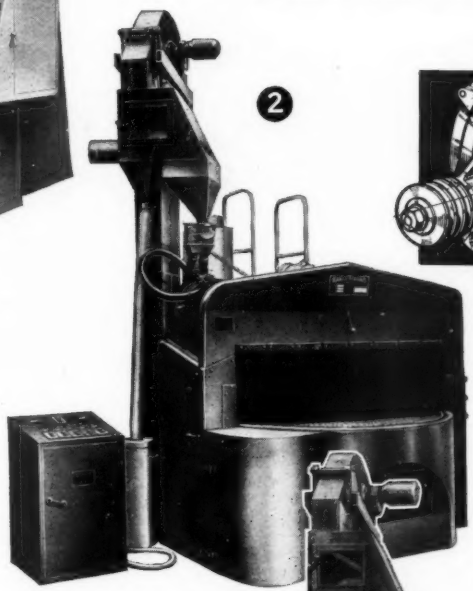
Shot Blast Equipment

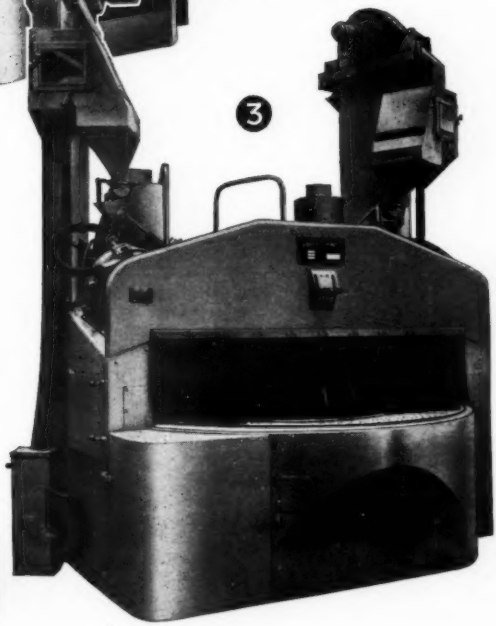
This A-S-L Turbine is the most modern Shot Blasting Unit available. The bi-phase air injection system enables shot to be projected at greater speeds using lower power with fewer replacements. The economies effected in spare parts alone are very substantial.



Baker Perkins High Speed Bi-Phase A-S-L Turbine, British Patent, No. 510681.

These machines do not require pits or special foundations.





1 **ROTARY BARREL**

2 **CADET**

3 **MEDIUM**

Our standard range of Rotating Barrel and Table Shot Blast Machines is capable of handling a wide range of Foundry products. Both types are semi-automatic, the rotating barrels being equipped with skip hoist loading gear and frontal discharge mechanism. These modern highly efficient machines are in use in Foundries all over the world, and are built to the high standards of design, materials and workmanship characteristic of all Baker Perkins' machines.

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Raw Material Markets

Iron and Steel

With adequate supplies of raw materials available, the blast furnaces are maintaining maximum outputs of pig-iron. From the bigger reconstructed furnaces and the new units which have been brought into operation outputs are increasing. The steelworks are now receiving tonnages more in keeping with their needs, and when the fresh furnaces now under construction are blown in, the increased quantities of basic pig-iron should meet the needs of the steelworks in their expanding outputs of ingot steel, and also lead to reduced imports of basic steelmaking pig-iron.

The present overall production of foundry pig-iron in all grades is more than enough for the needs of the foundries. They can generally obtain the pig-iron of their choice from stocks held by the furnaces, so that there is no necessity for them to carry stocks. In view of the present uncertain forward outlook in business and the economic conditions, the foundries are content to order only those tonnages required for current production of castings.

Makers of hematite pig-iron are disposing of most of their makes to the foundries and steelworks, and in low-phosphorus irons some producers have stocks on hand. These are not large, however, and if the present increased demand for castings from the motor-car industry continues, these stocks as well as full outputs are likely to be absorbed in the near future. Refined iron makers have tonnages to spare and consignments are available for shipment abroad. High-phosphorus pig-iron is plentiful, and demands from all users including the light, jobbing, textile, and some of the engineering foundries are still moderate.

In the light casting and textile trades, which have for so long been only partially employed, future business prospects are not bright; forward business is very scarce and subject to severe competition. Scrap deliveries are satisfactory, the chief demand continuing for heavy cast iron and machinery scrap. Foundry coke is coming forward regularly and in sufficient quantities to meet requirements, while ganister, limestone, and firebricks are available on request.

The re-rollers continue to obtain good outputs with the orders on hand for small bars, light sections, etc. Business continues to be placed regularly by consumers and stockists and, while the tonnages are not so heavy as before, fairly good order-books are on hand. Reinforcing bars are in heavy demand, and although there has been some improvement recently in the call for sheets and strip, the re-rollers are in a position to accept increased business for fairly prompt delivery.

Good supplies of steel semis are on hand and home steelworks are usually able to make good any deficiencies from the improved consignments which they continue to send forward in most of the sizes and grades required.

Non-ferrous Metals

The Rhodesian Selection Trust group of companies on Monday reduced its copper selling price by £10 to £230 a ton. While a price cut had been envisaged, the charge, when announced, caused the London spot price to drop a full £2 10s. a ton on top of the £4 a ton fall on the previous Friday in anticipation of the announcement. There was a further sharp fall in the price on Tuesday, but there was a recovery on the following day.

The RST price reduction is the first to be made since February 19 when it was reduced to £240 a ton at the same time as the US primary producers posted their new price of 32 cents a pound. At present, however, the US primary producers are maintaining their price at 32 cents a pound in spite of a reduction in the smelters' quotation to 30 cents and an export price of 28¾ cents a pound. All forecasts that the producers would lower their quotation—despite the cogent reasons advanced—have all proved wrong. Even so, it is still difficult to believe that the 32 cents a pound level can be held for much longer. Indeed, this is equivalent to £256 a ton and compares with an LME price around £30 per ton cheaper. Meanwhile, copper markets both here and in New York are flat, with consumers only absorbing minimum requirements. Stocks of copper in LME warehouses rose last week from 9,747 tons to 9,893 tons.

Lead is an uninteresting market on both sides of the Atlantic. Some pressure is becoming apparent on the New York price of 14 cents a pound. But not enough as yet to render demand ineffective.

Zinc is also a weak market and in the US demand at 11 cents a pound for "Prime Western," East St. Louis, is still behind production. Reduction in output has been announced by the American Zinc & Lead Smelting Company of approximately 1,500 tons a month.

Tin continues quietly steady with the accent on "quiet." No selling pressure has developed and the spreading "go slow" movement in the East is helping to sustain the present price.

House Organs

The Boncaster, Spring, 1957; issued by Bonnington Castings, Limited, Claremont Crescent, Edinburgh.

This magazine is issued to the staff of the company, and if its main object is to enlist their interest in the firm's business, the contents are essentially apt. Mr. Douglas W. L. Menzies, in the opening article, speaks frankly of the immediate future; this is followed by a story of the activities of Mr. W. Todd, who represents the firm in Birmingham. In the centre of the magazine, there is eulogistic comment on the B.Q. moulding machine, recently delivered to the firm by the British Moulding Machine Company, Limited. It is the first to be installed in Scotland, and the article discloses that close co-operation has been received from all concerned with its installation and operation. The reviewer suggests that in the future, such phrases as "the left-handed operator" should be replaced by "'John MacTavish' who is left-handed," as the magazine is designed for internal reading. Finally, the activities of the firm's social organizations are well covered.

Spear News, No. 21; issued by Spear & Jackson, Limited, Aetna Works, Savile Street, Sheffield.

This issue records the retirement of Mr. Harry Broadbent, M.I.MECH.E., a director who has been 27 years with the company. There is also a picture of a hammer, the handle of which, through prolonged usage, has developed a slender waistline, resulting in a particularly comfortable grip for handling. There would seem to be a danger in the continued use of such a tool, however, because the handle must now be very weak, and liable to fracture if the hammer were used for a heavy blow.

Crossley Chronicles, No. 195; issued by Crossley Brothers, Limited, Manchester, 11.

This issue is entirely devoted to a well-illustrated description of the Calder Hall atomic power station.

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CMF. 20

Current Prices of Iron, Steel, and Non-ferrous Metals

(Delivered unless otherwise stated)

June 19, 1957

PIG-IRON

Foundry Iron.—No. 3 IRON, CLASS 2:—Middlesbrough, £20 1s. 0d.; Birmingham, £19 13s. 3d.

Low-phosphorus Iron.—Over 0.10 to 0.75 per cent. P, £21 18s. 0d., delivered Birmingham. Staffordshire blast-furnace low-phosphorus foundry iron (0.10 to 0.50 per cent. P, up to 3 per cent. Si), d/d within 60 miles of Stafford, £22 2s. 3d.

Scotch Iron.—No. 3 foundry, £23 4s. 6d., d/d Grangemouth.

Cylinder and Refined Irons.—North Zone, £24 6s. 6d.; South Zone, £24 9s. 0d.

Refined Malleable.—P, 0.10 per cent. max.—North Zone, £25 14s. 0d.; South Zone, £25 16s. 6d.

Hematite.—Si up to 2 per cent., S. & P. over 0.03 to 0.05 per cent.:—N.-E. of England (local iron), £22 17s. 6d.; Scotland (Scotch iron), Zone S. 1, £23 4s. 0d.; Sheffield, £24 4s. 6d.; Birmingham, £24 12s. 0d.; Wales (Welsh iron), £22 17s. 6d.

Basic Pig-iron.—£19 3s. 0d. all districts.

FERRO-ALLOYS

(Per ton unless otherwise stated, delivered)

Ferro-silicon (6-ton lots and over).—45 per cent. Si, £50 0s. 0d. to £53 5s. 0d., scale 17s. 0d. to 17s. 6d. per unit; 75 per cent. Si, £70 0s. 0d. to £76 7s. 6d., scale 17s. 0d. to 17s. 6d. per unit.

Ferro-vanadium.—50/60 per cent., 28s. 6d. per lb. of V.

Ferro-molybdenum.—65/75 per cent., carbon-free, 12s. 3d. per lb. of Mo.

Ferro-titanium.—20/25 per cent., 2-3 per cent. Cu, £250 0s. 0d.; 38/40 per cent., commercially carbon-free, £299 0s. 0d.

Ferro-tungsten.—80/85 per cent., 11s. 2d. per lb. of W.

Tungsten Metal Powder.—98/99 per cent., 14s. 2d. per lb. of W.

Ferro-chrome (6-ton lots and over).—4/6 per cent. C, £96 0s. 0d. to £99 10s. 0d., basis 60 per cent. Cr, scale 33s. 0d. per unit; over 6 per cent. C, £94 0s. 0d., basis 60 per cent. Cr, scale 31s. 0d. to 33s. 0d. per unit; 2 per cent. C,* 2s. 2d. per lb. Cr.; 1 per cent. C,* 2s. 2½d. per lb. Cr; 0.15 per cent. C,* 2s. 3d. to 2s. 3½d. per lb. Cr; 0.10 per cent. C,* 2s. 3½d. to 2s. 3¾d. per lb. Cr; 0.06 per cent. C,* 2s. 3¼d. to 2s. 4d. per lb. Cr.

Metallic Chromium.—98/99 per cent., 7s. 0d. to 7s. 6d. per lb.

Metallic Manganese.—90/92 per cent., carbon-free, £290 0s. 0d.; 96/98 per cent., £310 0s. 0d.

Ferro-columbium.—65/75 per cent., Nb + Ta, 22s. 0d. to 22s. 6d. per lb., Nb + Ta.

Ferro-manganese (home).—78 per cent., £82 12s. 6d.

SEMI-FINISHED STEEL

Re-rolling Billets, Blooms, and Slabs.—BASIC: Soft, u.t., £30 9s. 0d.; tested, 0.08 to 0.25 per cent. C, £31 9s. 0d.; hard (0.41 to 0.60 per cent. C), £32 10s. 6d.; silico-manganese, £41 0s. 0d.; free-cutting, £34 13s. 0d. SIEMENS MARTIN ACID: Up to 0.25 per cent. C, £38 4s. 6d.; silico-manganese, £41 7s. 6d.

Billets, Blooms, and Slabs for Forging and Stamping.—Basic, soft, up to 0.25 per cent. C, £36 3s. 6d.; basic, hard, over 0.41 up to 0.60 per cent. C, £37 6s. 0d.; acid, up to 0.25 per cent. C, £40 7s. 6d.

FINISHED STEEL

Heavy Plates and Sections.—Ship plates (N.-E. Coast), £39 2s. 0d.; boiler plates (N.-E. Coast), £41 12s. 0d.; floor plates (N.-E. Coast), £40 11s. 0d.; sectional material, N.-E. Coast, £37 11s. 6d.

Small Bars, Sheets, etc.—Rounds and squares, under 3 in., untested (4-ton lots), £37 18s. 0d.; flats, 5 in. wide and under (4-ton lots), £37 18s. 0d.; hoop and strip, £37 17s. 6d.; uncoated strip mill coils, hot rolled, under 3mm. to 12g., £41 6s. 0d.; black sheets (hand mill), 17/20 g., £52 4s. 6d.; galvanized corrugated sheets, 24 g., £65 2s. 0d.

Alloy Steel Bars.—1 in. dia. and up: Nickel, £65 10s. 3d.; nickel-chrome, £92 13s. 0d.; nickel-chrome-molybdenum, £104 11s. 6d.

NON-FERROUS METALS

Copper.—Cash, £232 0s. 0d. to £232 10s. 0d.; three months, £234 0s. 0d. to £234 10s. 0d.; settlement, £232 10s. 0d.

Copper Tubes, etc.—Solid-drawn tubes, 2s. 3½d. per lb.; rods, 263s. 6d. per cwt. basis; 20 s.w.g., 296s. 9d. per cwt.

Tin.—Cash, £762 10s. 0d. to £763 10s. 0d.; three months, £760 0s. 0d. to £761 0s. 0d.; settlement, £763 10s. 0d.

Lead (Refined Pig).—Second half June, £89 15s. 0d. to £90 0s. 0d.; second half September, £90 0s. 0d. to £90 5s. 0d.

Zinc.—Second half June, £72 15s. 0d. to £73 0s. 0d.; second half September, £72 10s. 0d. to £72 12s. 6d.

Zinc Sheets, etc.—Sheets, 15g. and thicker, all English destinations, £107 10s. 0d.; rolled zinc (boiler plates), all English destinations, £105 5s. 0d.; zinc oxide (Red Seal), d/d buyers' premises, £95.

Brass Tubes, etc.—Solid-drawn tubes, 1s. 10d. per lb.; rods, drawn, 2s. 11d.; sheets to 10 w.g., 200s. 9d. per cwt.; wire, 2s. 7⅝d.; rolled metal, 194s. 9d. per cwt.

Brass (Brazing).—BS1400, B3 (65/35), £159; B6 (85/15), — ; BS249, —.

Brass (High Tensile).—BS1400, HTB1 (30 tons), £220; HTB2 (38 tons), — ; HTB3 (48 tons), — .

Gunmetal.—BS1400, LG2 (85/5/5/5), £210; LG3 (86/7/5/2), £222; G1 (88/10/2/½), £277; (88/10/2/1), £264.

Phosphor Bronze.—BS1400, PB1 (AID released), £295 per ton.

Phosphor Bronze Strip, etc.—Strip, 283s. 9d. per cwt.; sheets to 10 w.g., 287s. 0d. per cwt.; wire, 3s. 11½d. per lb.; rods, 3s. 3½d.; tubes, 3s. 3¾d.; chill cast bars: solids 3s. 3d., cored 3s. 4d. (CHARLES CLIFFORD, LIMITED.)

Nickel Silver, etc.—Rolled metal, 3 in. to 9 in. wide × 0.056, 3s. 8¾d. per lb.; round wire, 10g. in coils (10 per cent.), 4s. 1½d.; special quality turning rod, 10 per cent., ½ in. dia., in straight lengths, 4s. 0½d. All prices are net.

Other Metals.—Magnesium, ingots, 2s. 5½d. per lb. Antimony, English, 99 per cent., £210 0s. 0d. Quicksilver, ex-warehouse, £90 0s. 0d. Nickel, £600 0s. 0d. Aluminium ingots, £197 0s. 0d.; aluminium bronze (BS1400), AB1, £252; AB2, £284.

* Average 68-70 per cent.